JOHN FLUKE MFG. CO., INC. P.O. BOX 7428 SEATTLE, WASH. 98133

FLUKE

8000A
digital multimeter

WARRANTY

Fluke guarantees that any model of the 8000A will meet the specifications published herein throughout one full year from the date you receive it. Further, any part which fails during that time will be replaced and the instrument recalibrated without charge.

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Section 1

Introduction & Specifications

1-1. DESCRIPTION

1-2. The compact and light weight Model 8000A is a three and one-half digit multimeter. A unique analog-to-digital conversion technique, with inherent self zeroing, eliminates offset uncertainties. Two LSI chips comprise the analog-to-digital converter providing a low discrete component count. Other features include automatic digital determination of polarity, continuous filtering, LED readout, and several options and accessories.

1-3. Pushbutton controls allow the selection of five ac and dc voltage ranges, five ac and dc current ranges, and six resistance ranges. Accurate measurement capabilities are from 100 microvolts to 1200 volts ac and dc, 100 nanoamperes to 1.999 amperes ac and dc, and 100 milliohms to 19.99 megohms.

1-4. OPTIONS

1-5. Four versions of the digital multimeter are available. The basic instrument is line powered and designated the 8000A. A rechargeable battery version of the basic instrument is designated the 8000A–01 option. Another line powered version, 8000A-02 option, is equipped with a Data Printer Output Unit for data aquisition systems or to drive a digital printer. However, Option –01 cannot be combined with Option –02.

These options are summarized in Table 1-1 and must be specified at the time of purchase. Operation, theory of operation, maintenance, and replaceable parts for these versions are described in the following Section 2 through Section 5.

Table 1-1. 8000A OPTIONS.

MODEL NO.	OPTION DESCRIPTION
8000A–01	Mainframe w/battery pack
8000A–02	Mainframe, line powered w/data output

1-6. ACCESSORIES

1-7. Several accessories are available for use with all versions of the 8000A. These accessories are listed in Table 1-2. A description of the individual accessories will be found in Section 6.

Table 1-2. 8000A ACCESSORIES.

MODEL NO.	ACCESSORY DESCRIPTION
C80	Carrying Case w/strap
A80	Universal Test Lead Kit
80K-30	High Voltage Probe (1kV to 30kV)
80RF	RF Probe (100kHz to 600MHz)
80I-600	Clamp-on AC Current Probe (2A to 600A)
M00-100-714	Front Panel Dust Cover
M00-200-612	Rack Mount, Center
M00-200-611	Rack Mount, Offset

1-8. SPECIFICATIONS

DC VOLTAGE

Ranges	±199.9mV, ±1.999V, ±19.99V, ±199.9V, ±1199V
Accuracy:	
1 year, 15°C to 35°C	±(0.1% of reading +1 digit)
Input Impedance	10 Megohms, all ranges
Normal Mode Rejection	Greater than 60db @ 50Hz, 60Hz
Common Mode Rejection (1kΩ unbalance)	Greater than 120db @ dc and 50Hz, 60Hz
Response Time	1/2 second
Maximum Input Voltage	1200V dc or 1200V rms (sinusoidal)

AC VOLTAGE

Ranges	199.9mV, 1.999V, 19.99V, 199.9V, 1199V
Accuracy:	
1 year, 15°C to 35°C	45Hz to 10kHz ±(0.5% +2 digits) 10kHz to 20kHz ±(1% +2 digits)
Input Impedance	10 megohms in parallel with 100pf
Common Mode Rejection (1kΩ unbalance)	Greater than 60db @ 50Hz, 60Hz
Response Time	3 seconds, worst case
Maximum Input Voltage	1200V rms (sinusoidal), not to exceed 10^7 volts · Hz product on 20, 200, 1200V ranges, 500V rms (sinusoidal) on 200mV and 2V ranges.

DC CURRENT

Ranges	±199.9μA, ±1.999mA, ±19.99mA, ±199.9mA, +1999mA

1 year, 15°C to 35°C	±(0.3% of reading +1 digit)
Voltage Burden	0.25V maximum on all ranges except 0.5V on 2000mA range.
Response Time	1/2 second
Maximum Input	2 Amps rms (fuse protected)

AC CURRENT

Ranges	199.9μA, 1.999mA, 19.99mA, 199.9mA, 1999mA
Accuracy:	
1 year, 15°C to 35°C	45Hz to 10kHz ±(1.0% of reading +2 digits) except 2000mA range. 45Hz to 3kHz ±(1.0% of reading +2 digits) on 2000mA
Voltage Burden	0.25V maximum on all ranges except 0.5V on 2000mA range.
Response Time	3 seconds
Maximum Input	2 Amps rms (fuse protected)

RESISTANCE

Ranges	199.9Ω, 1.999kΩ, 19.99kΩ, 199.9kΩ, 1999kΩ, 19.99MΩ
Accuracy:	
1 year, 15°C to 35°C	200Ω, 2kΩ, 20kΩ, 200kΩ, 2000kΩ ranges ±(0.2% of reading +1 digit) 20MΩ range ±(0.5% of reading +1 digit)
Response Time	200Ω, 2kΩ, 20kΩ, 200kΩ, 2000kΩ ranges: 1/2 second 20MΩ range: 4 seconds
Current through Unknown	200Ω Range 1mA 2kΩ Range 1mA 20kΩ Range 100μA 200kΩ Range 1μA 2000kΩ Range 1μA 20MΩ Range 0.1μA

Accuracy:

Maximum Input Voltage	200Ω and 2kΩ Ranges	130V rms
	20kΩ thru 20MΩ Ranges	250V rms

TEMPERATURE COEFFICIENTS (–10°C to 15°C and 35°F to 55°F)

DC V	±(0.01% reading/°C + .005% F.S/ °C)
DC MA	±(0.015% reading/ °C + 0.005% F.S./ °C)
KΩ	±(0.015% reading/ °C + 0.005% F.S./ °C)
10 Meg	±(0.02% reading/ °C + 0.005% F.S./ °C)
AC V	±(0.01% reading/ °C + 0.005% F.S./ °C)
AC MA	±(0.015% reading/ °C + 0.005% F.S./ °C)

DIGITAL PRINTER OUTPUT UNIT, OPTION –02

Data Available	Polarity, Overload, Digits and Overrange Bit
Flag	Busy (modifiable to Ready)
Control Inputs	Continuous Update and Data Update
Output Logic Levels	Logic "1" = 4.3 to 5.7 volts thru 15 kΩ pullup (modifiable to 15 volts maximum)
	Logic "0" = 0 to 0.4 volts, will sink 6mA
Printer Reference	5 volts thru 15kΩ for reference high
Miscellaneous	TTL compatible and buffered outputs

ENVIRONMENTAL

Operating Temp. Range	−10°C to +55°C
Storage Temp. Range	−40°C to +75°C (−40°C to +60°C with batteries)
Humidity Range	0 to 80% RH
Shock and Vibration	Meets requirements of MIL-T-21200K and MIL-E-16400F

GENERAL

Maximum Common Mode Voltage	1200V peak
Display	7-segment LED, 0.25" character height
Size	Approx. 8½" wide x 2½" high x 10" deep (see outline drawing, Figure 1-1)
Weight	2¾ lbs. (1,2Kg) without batteries, 4lbs. (1,8Kg) with batteries
Power	100-115-230V ac, 50 to 400Hz, 2 watts
Battery Option (−01)	8-hour or more operation on internal rechargeable batteries.

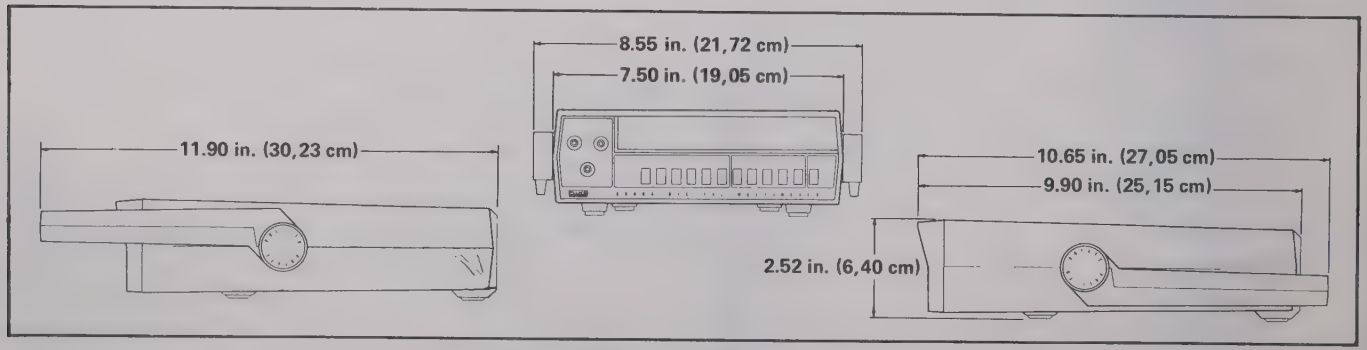


Figure 1-1. MODEL 8000A OUTLINE DRAWING

Section 2
Operating Instructions

2-1. INTRODUCTION

2-2. This section contains information regarding installation and operation of the Model 8000A. The contents of this section should be read before operating the digital multimeter. Operating instructions for accessories are described in the accessories section, Section 6. Should any difficulties be encountered during operation, please contact your nearest John Fluke Sales Representative or the John Fluke Mfg. Co., Inc. P.O. Box 7428, Seattle, Washington, 98133, telephone (206) 774-2211. A list of Sales Representatives is located on the inside of the rear cover.

2-3. INPUT POWER

2-4. The Model 8000A and 8000A-01 are supplied with one of three ac input power configurations. These consist of the Model 8000A/10 (100 volts, 50 to 400Hz), Model 8000A (115 volts, 50 to 400Hz), and Model 8000A/23 (230 volts, 50 to 400Hz). Before connecting to ac line power, insure that the instrument is in the proper configuration for your power requirements. A decal on the underside of the instrument indicates which ac line voltage is required.

2-5. RACK INSTALLATION

2-6. The Model 8000A may be mounted in a standard 19 inch rack when supplied with the appropriate rack mounting kit (refer to Table 1-1). Rack mounting kits are available to allow left, right or center mounting. Instructions for installing units in the rack mount are supplied with the rack mounting kit. These instructions are repeated in Section 6.

2-7. OPERATING FEATURES

2-8. The location and function of all controls, connectors, and indicators are shown in Figure 2-1. Operating features and instructions for accessories are discussed in Section 6.

2-9. OPERATING NOTES

2-10. Fuse

2-11. The MA INPUT terminal is also a fuseholder for the current protection fuse, F2. By twisting the terminal in the direction indicated on the front panel, the fuse can be removed. A replacement fuse is shipped with each instrument. The line fuse, F1, is located near the power transformer. To gain access to this fuse, remove the retaining screw at the rear of instrument case, and remove instrument from case.

2-12. Battery Power, Option –01

CAUTION!

Damage may result if alkaline, zinc-carbon or mercury batteries are charged.

2-13. Power for the Model 8000A 01 is supplied by internal rechargeable batteries that allow the instrument to operate for at least eight hours. Whenever the light quality of the display is too low to read, the batteries should be recharged. Recharging is most rapidly accomplished by switching to OFF and connecting the instrument to the ac power line. In this way, the discharged batteries can be completely charged in approximately 12 to 14 hours. The instrument can also be operated when recharging on ac power, but recharging time will be extended to approximately 43 hours.

NOTE!

Battery manufacturers recommend that nickle-cadmium batteries should not be stored for extended periods of time without recharging at least every 90 days. Storage temperatures below 25°C are recommended.

2-14. Input Connections

2-15. Three INPUT terminals (MA, V–Ω, and COMMON) provide connection to the source or resistance under measurement. For source measurements, the MA or V–Ω and COMMON terminals connect to the respective high and low sides of the source. An unknown resistance is connected between the V–Ω and COMMON terminals.

2-16. Overload Protection ⚠

2-17. An overload condition is indicated by the simultaneous flashing of the display readouts. The dc voltage function can sustain up to 1200 volts dc or 1200 volts rms, sinusoidal, between the V–Ω and COMMON terminals on any range. The ac voltage function can sustain up to 1200 volts rms (not to exceed 10^7 volt·hertz) on the 20, 200 and 1200 volt ranges and 500 volts rms, sinusoidal, on the 200 millivolt and 2 volt ranges between the V–Ω and COMMON terminals. The current input is fuse protected above 2 amperes rms with a maximum of 2 volts rms between the MA and COMMON terminals. Protection for the resistance function is to **130 volts rms between the V–Ω and COMMON terminals** in the 200 ohm and 2 kilohm ranges, and 250 volts rms in the 20 kilohm through 20 megohm ranges.

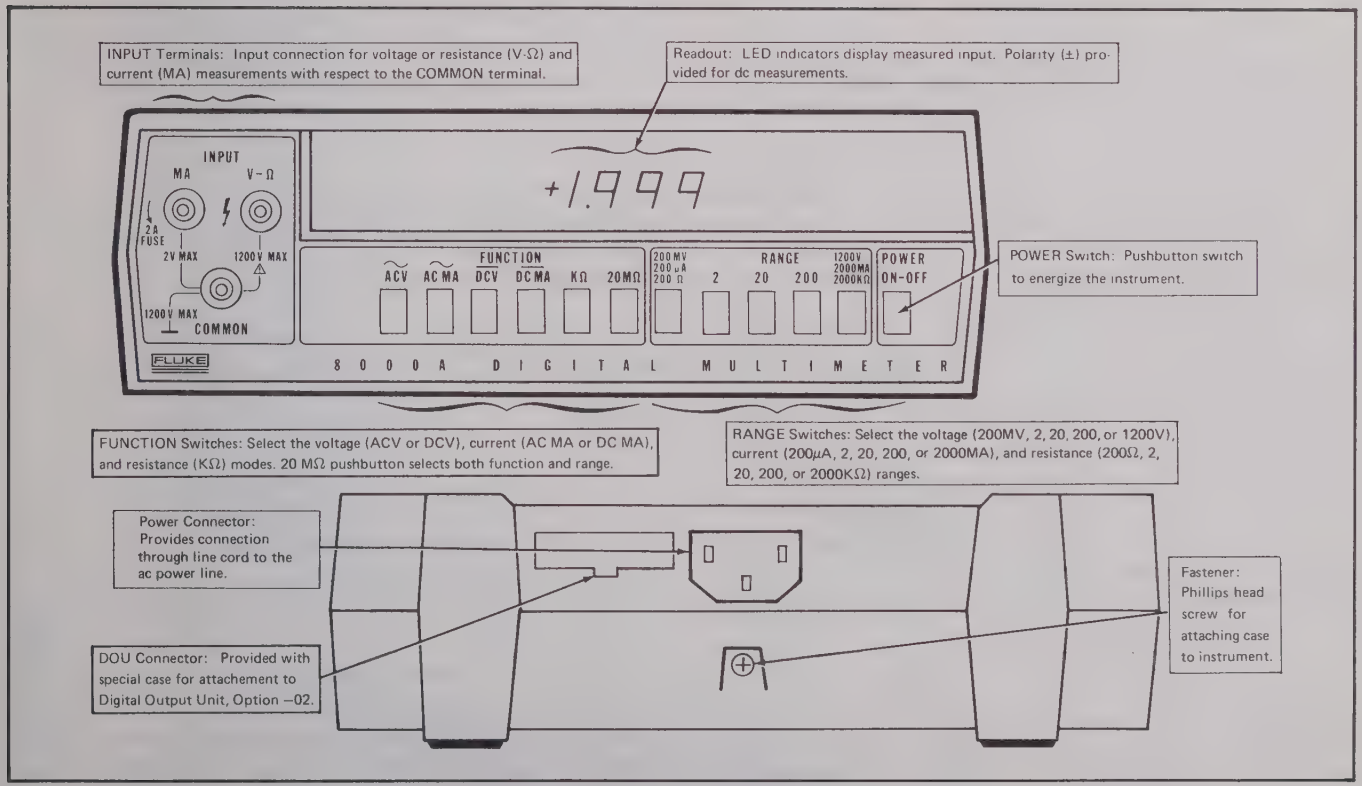

INPUT Terminals: Input connection for voltage or resistance (V-Ω) and current (MA) measurements with respect to the COMMON terminal.
Readout: LED indicators display measured input. Polarity (±) provided for dc measurements.
INPUT
MA
V-Ω
2A FUSE
2V MAX
1200V MAX
1200V MAX
COMMON
+1.999
FUNCTION
ACV
AC MA
DCV
DC MA
KΩ
20MΩ
200MV
200 μA
200 Ω
RANGE
2
20
200
1200V
2000MA
2000KΩ
POWER
ON-OFF
POWER Switch: Pushbutton switch to energize the instrument.
FLUKE
8 0 0 0 A D I G I T A L M U L T I M E T E R
FUNCTION Switches: Select the voltage (ACV or DCV), current (AC MA or DC MA), and resistance (KΩ) modes. 20 MΩ pushbutton selects both function and range.
RANGE Switches: Select the voltage (200MV, 2, 20, 200, or 1200V), current (200μA, 2, 20, 200, or 2000MA), and resistance (200Ω, 2, 20, 200, or 2000KΩ) ranges.
Power Connector: Provides connection through line cord to the ac power line.
DOU Connector: Provided with special case for attachement to Digital Output Unit, Option –02.
Fastener: Phillips head screw for attaching case to instrument.

Figure 2-1. OPERATING FEATURES

2-18. BASIC DMM MEASUREMENT

2-19. Table 2-1 lists the proper FUNCTION pushbuttons, RANGE pushbuttons, and INPUT terminal connections for performing specific measurements. These instructions, regarding front panel operation, apply to all Model 8000A's with or without options. Operation of the DMM with range extending accessories are discussed in Section 6 under the particular accessory.

Table 2-1. BASIC MEASUREMENT INSTRUCTIONS

MEASUREMENT	FUNCTION	RANGE	INPUT CONNECTION	MAXIMUM OVERLOAD	REMARKS
DC Volts	DCV	200MV, 2, 20 200, or 1200V	V–Ω and COMMON	1200V dc or 1200V rms (sinusoidal)	Auto-polarity
DC Milliamperes	DC MA	200μA, 2, 20 200 or 2000MA	MA and COMMON	2A (Fuse Protected)	
AC Volts	ACV	200MV, 2, 20 200 or 1200V	V–Ω and COMMON	1200V rms (sinusoidal), not to exceed 10^7 V·Hz on 20, 200, 1200V ranges. 500V rms (sinusoidal) on 200mV and 2V ranges	
AC Milliamperes	AC MA	200μA, 2, 20 200, or 2000MA	MA and COMMON	2A (Fuse Protected)	
Kilohms	KΩ	200Ω, 2, 20 200, or 2000KΩ	V–Ω and COMMON	130V rms, 200Ω and 2kΩ ranges. 250V rms, 20kΩ thru 2000kΩ ranges.	
Megohms	20MΩ	Any	V–Ω and COMMON	250V rms	Range switches non-functional

2-20. DIGITAL PRINTER OUTPUT UNIT, OPTION –02, OPERATION

2-21. Introduction

2-22. The Model 8000A–02 Digital Multimeter provides non-isolated buffered data output for input to data systems or to drive a digital printer. Data output is in parallel BCD format and consists of digits, polarity, overload information, a +5 volt printer reference and busy flag.

Table 2-2. DPOU OUTPUT DATA

PIN		OUTPUTS	LINES
2		MSD (MOST SIGNIFICANT DIGIT) Logic "1" = decimal 1 Logic "0" = decimal 0	1
10 11 12 4	(8) (4) (2) (1)	2SD OUTPUT LOGIC LEVELS: Logic 0 = 0 to +0.4V; Logic 1 = +4.3V to +5.7V	4
19 3 6 14	(8) (4) (2) (1)	3SD	4
18 7 20 9	(8) (4) (2) (1)	LSD (Least Significant Digit)	4
8		Polarity - Logic 1 = "+", "AC", "Ω", Logic 0="–"	1
5		Overload-Logic 1 = overload, Logic 0=no overload	

2-23. Description

2-24. The DPOU is housed within the Model 8000A–02 case. Output from the DPOU is through a twenty pin connector located at the rear of the instrument case. A mating connector with backshell and strain relief is supplied for fabrication of an interface cable assembly. Paragraph 2-30 gives the procedure for wiring to the mating connector. Pin assignments for output data are given in Table 2-2. Input command assignments are in Table 2-3.

Table 2-2. DPOU OUTPUT DATA (*Continued*)

PIN	OUTPUTS	LINES
13	Busy Flag - Logic 1 = busy, Logic 0 = not busy	1
16	Common	1
1	Reference - reference high = +5V through 15kΩ	1

Table 2-3. DPOU INPUT DATA

CONTROL / DATA	DATA UPDATE	CONTINUOUS UPDATE
Pin Assignments	15	17
Logic "1"	Open or +5V (for reset)	Open or +5V (data hold)
Logic "0"	0V to +0.4V* (negative transition causes update)	0V to +0.4V* (continuous update, 6 times/sec)
Pulse Width	⩾ 10 μsec.	– – – – – – –

*Or contact closure to common.

2-25. The DPOU is triggered internally when commanded by one of two external control lines; Data Update and Continuous Update. Data Update line, pin 15, updates the DPOU each time the command changes from logic 1 to logic 0 (negative transition). Data Update command rates greater than three times per second will cause duplication of data output. Holding the Continuous Update line, pin 17, at logic 0 causes data output to be updated at the internal trigger rate of the DPOU; typically six times per second.

2-26. The updating period is signified by a logic 1 at the Busy Flag, pin 13. External commands during the Busy period will be ignored. Calling the DPOU for data does not affect the digital multimeter measurement cycle. Any input changes to the digital multimeter after the DPOU has been commanded for update will not be reflected in the data output, although present in digital readout. The new data will not be available until the DPOU is commanded again.

2-27. Optional Modification

2-28. Two provisions in the design of the DPOU PCB Assembly gives the user an optional Ready Flag and ability to use an external pull-up voltage to 15 volts maximum. Procedures for changing the Busy Flag to Ready and providing for an external pull-up voltage are described in Section 4.

2-29. DPOU Mating Connector Assembly

2-30. Use the following procedure for installing the connector assembly supplied with the 8000A–02.

2-31. MATERIALS REQUIRED

a. # 26 wire, teflon or vinyl insulated

b. Sleeving, # 16 for vinyl insulated wire or # 18 for teflon insulated wire

c. 60/40 rosin core solder

d. Wire stripper

e. Soldering iron, pencil-type (45W max.)

f. Vise or similar holding device for connecotr

2-32. ASSEMBLY PROCEDURE

a. Slide wire bundle through backshell, see Figure 2-2a.

b. Strip 1/8 inch insulation from wires (20) and tin ends.

c. Cut 20 pieces of sleeving to 3/16 inch lengths.

d. Slide sleeving over prepared wire ends, far enough to prevent interference while soldering.

e. Place connector in holding device and tin lugs.

f. Note numbering sequence in Figure 2-3a.

g. Solder one prepared wire to each lug, refer to Figure 2-3b.

h. Assemble backshell and connector, see Figure 2-2a.

i. Secure wire bundle at rear of backshell with Panduit supplied, see Figure 2-2b, to complete assembly.

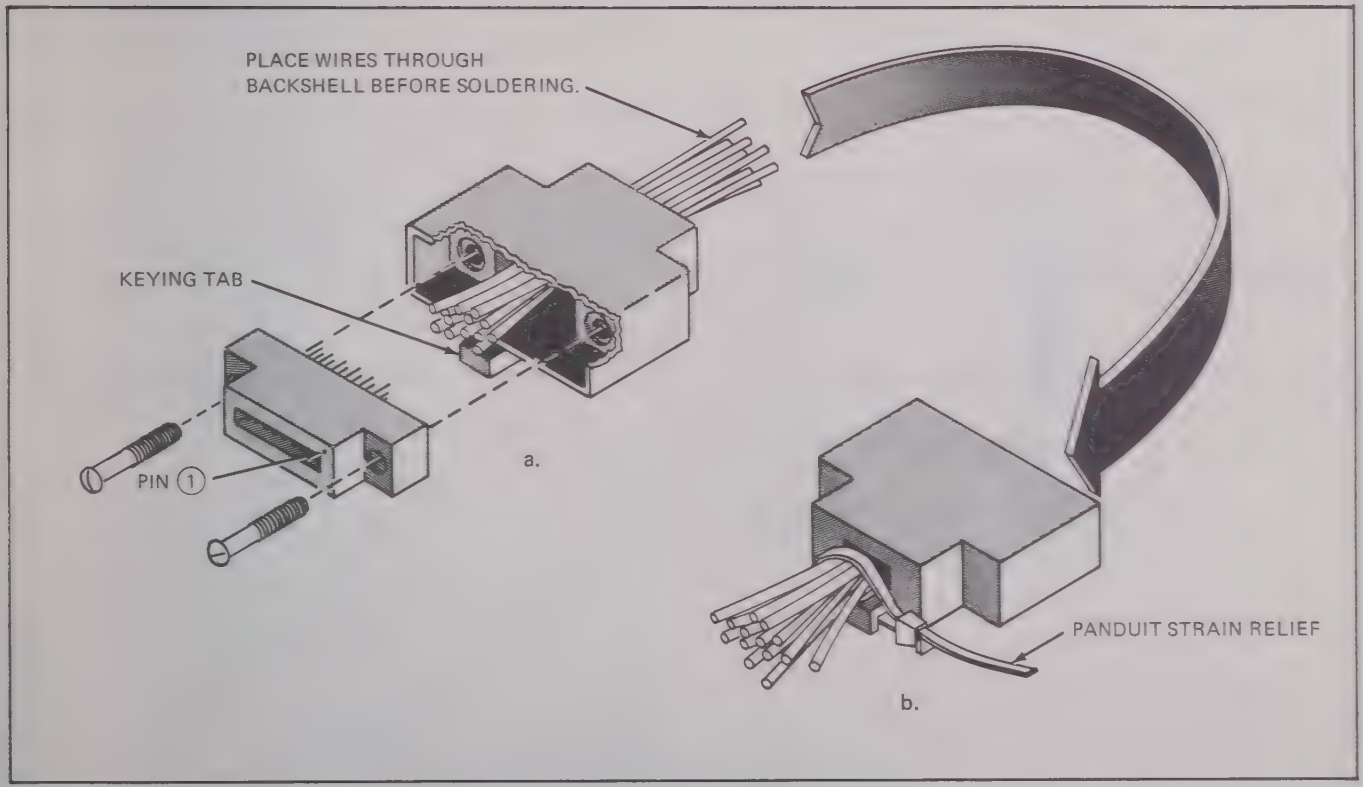
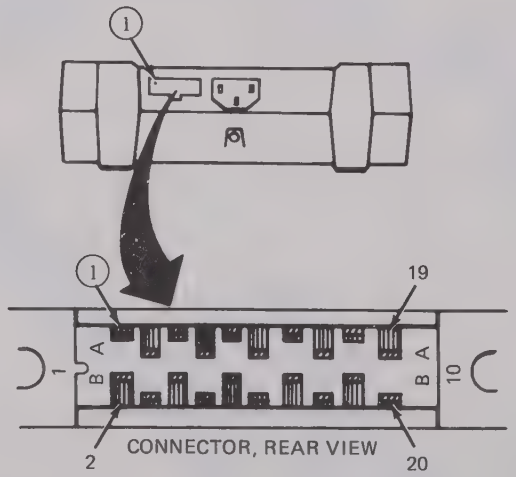
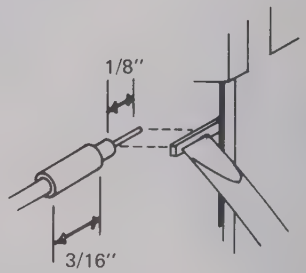


FIGURE 2-2. BACKSHELL ASSEMBLY



a.



b.

Figure 2-3. CONNECTOR ASSEMBLY.

Section 3
Theory of Operation

3-1. INTRODUCTION

3-2. Information about the Model 8000A theory of operation is arranged under two major headings. One heading is titled BLOCK DIAGRAM ANALYSIS. Discussion at the block diagram level consists of the overall operation of the major circuits within the instrument. The other heading is titled CIRCUIT DESCRIPTIONS. At this level, the discussion consists of component functions within the major circuits. Block diagrams and simplified schematics are included in this section. Schematic diagrams are located at the rear of this manual.

3-3. BLOCK DIAGRAM ANALYSIS

3-4. Introduction

3-5. Note in the block diagram, Figure 3-1, that the toned areas divide the instrument into three major sections. These sections, Signal Conditioning, Analog-to-Digital Converter, and Display, are discussed separately in the following paragraphs. Figure 3-2 illustrates a block diagram of the Digital Printer Output Unit, Option –02, which is also discussed in the following paragraphs.

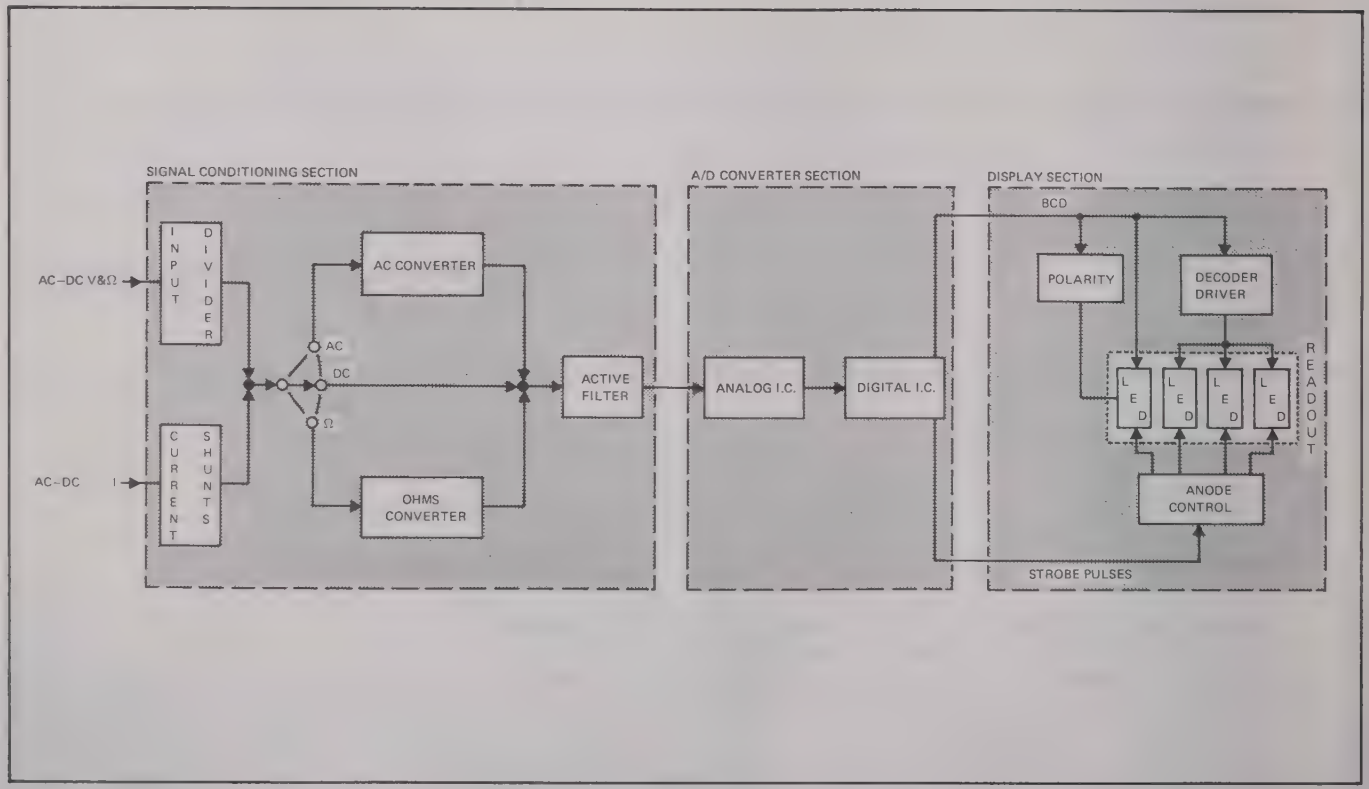


Figure 3-1. MODEL 8000A BLOCK DIAGRAM

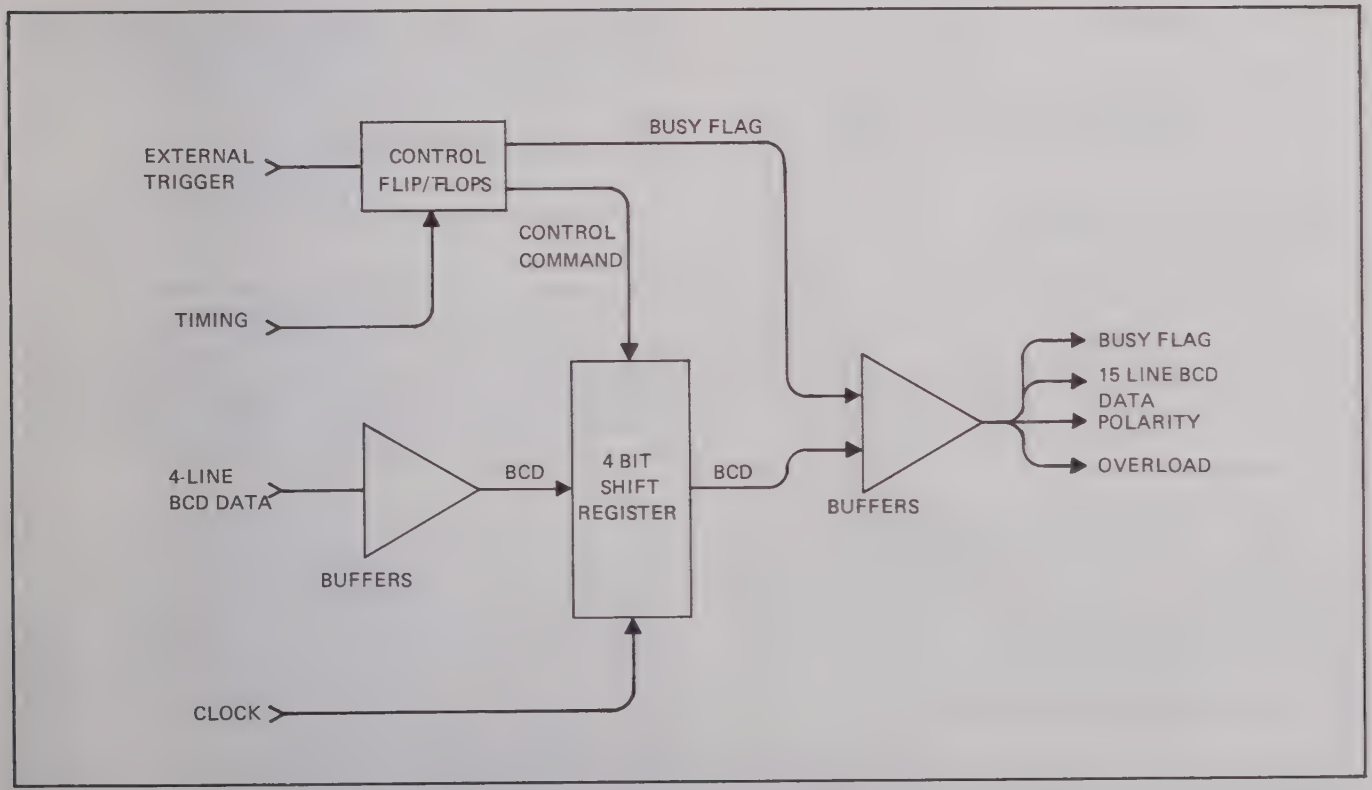


Figure 3-2. DPOU BLOCK DIAGRAM

3-6. Signal Conditioning

3-7. The Signal Conditioning section provides a dc analog voltage, characteristic of the applied input, to the Analog-to-Digital Converter section. This task is accomplished by the Input Voltage Divider, Current Shunts, AC Converter, Active Filter, and associated switching.

3-8. Analog-to-Digital Converter

3-9. The Analog to Digital (A/D) Converter section changes the dc output voltage from the Signal Conditioning section to digital information. This is accomplished by a unique A/D conversion technique that eliminates zero error. Two LSI (Large Scale Integration) circuits comprise the A/D Converter. These circuits are the Analog Integrated Circuit and the Digital Integrated Circuit.

3-10. Display

3-11. Digital information from the A/D Converter section is decoded and visually presented by the Display section. The decoded digital information is displayed on numerical LED (Light Emitting Diode) readouts. Decoding of the digital information is accomplished by the Polarity, Decoder Driver, and Anode Control Circuits.

3-12. Digital Printer Output Unit, Option -02

3-13. Serial input data to the Display Section is also applied to the DPOU where it is converted to parallel BCD output. As seen in Figure 3-2, the BCD input is applied through Buffers to a 4-Bit Shift Register. Commands for controlling the register come from the Control Flip-Flops. Timing information from the 8000A and external trigger commands tell the Control Flip-Flops when to load and unload the register.

3-14. CIRCUIT DESCRIPTIONS

3-15. Analog-to-Digital Converter

3-16. GENERAL. The A/D Converter uses a voltage to frequency conversion technique. A dc voltage at the input of the A/D Converter is changed to a frequency by the Analog Integrated Circuit. This frequency is characteristic of the magnitude and polarity of the dc input voltage. Counting of the output frequency from the Analog I.C. is accomplished by the Digital Integrated Circuit. The resultant count is transferred in BCD (Binary Coded Decimal) format to the Dispaly section.

3-17. ANALOG I.C. The frequency output from the Analog I.C. varies ±40kHz from a rest frequency of approximately 80kHz. Input switching circuitry within the Analog I.C. (refer to Figure 3-2) alternately samples between input common and the dc voltage input at a 120 millisecond rate. During the input common sample period the output of the Voltage to Frequency (V/F) Converter is at the rest frequency. The following input voltage sample generates an output frequency above or below the rest frequency for a respective negative or positive input voltage. Therefore, the dc input voltage to the A/D Converter becomes a function of the difference of two frequencies and consequently any zero errors are eliminated.

3-18. The resistor R_{range}, in Figure 3-3, symbolizes the dual range capability of the Analog I.C. chip. This resistance, external to the chip, consists of series resistors R23, R57, R25, and R58. When the instrument is in the 2 volt basic range, all four resistors are used to scale the current to the V/F Converter. Variable resistor R25 is the calibration adjustment for this range. For operation in the 0.2 volt basic range, the switching provides a short across R25 and R58. Therefore, only resistor R57 and calibration adjustment R23 scale the current to the proper level for the V/F Converter.

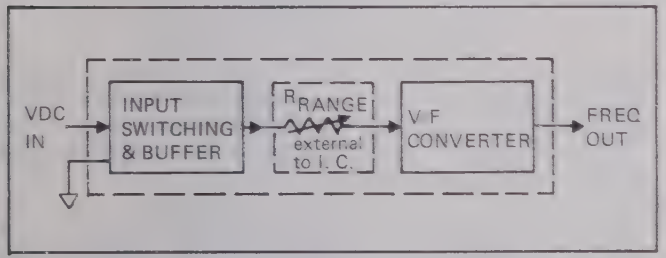


Figure 3-3. ANALOG I.C. BLOCK DIAGRAM

3-19. Timing circuitry for the A/D Converter is contained in the Analog Integrated Circuit. The connection between the Analog I.C. and the Digital I.C. is through R41, Q6, R56, and adjustment R20. Timing adjustment is accomplished by setting PERIOD adjust R20.

3-20. Overload protection for the Analog I.C. is provided by transistors Q20 and Q21. Negative overload voltages are handled by Q20 and positive overloads by Q21.

3-21. DIGITAL I.C. The output from the Analog I.C. alternates between the rest frequency during one time period and a frequency corresponding to the A/D Converter input voltage during the next period. Reversible counters in the Digital I.C. count these frequencies such that their difference is used to provide the BCD Information.

3-22. A four line BCD output (W-X-Y-Z on schematic) and a four line strobing pulse output (S1-S2-S3-S4 on schematic) are provided by the Digital I.C. to the Display section. The BCD lines W-X-Y-Z correspond to binary 8-4-2-1 positions, respectively.

3-23. Display

3-24. POLARITY. The polarity indicator consists of horizontal and vertical LED segments on DS1. These segments are strobed during the S1 time period, when the instrument is in the DCV or DC MA modes. The horizontal segment is used alone for a negative indication and together with the vertical segment to build a positive indication. Consequently, the horizontal segment must illuminate during each S1 time period. This is accomplished by S3D (DCV) or S4C (DC MA) which ground the cathodes of the horizontal LED segment. Illumination of the vertical segment relies upon the digital information provided by the Y BCD line during S1 time. When a positive voltage or current is applied to the INPUT terminals, the Y line goes high. This turns on Q8 and Q10 which allow the vertical segment to illuminate. With the Y line low, corresponding to a negative input, Q8 and Q10 are cut off and the vertical segment does not illuminate.

2-25. DECODER DRIVER. The Decoder Driver, U5, translates the BCD information on the W-X-Y-Z lines for application to the LED readouts

DS2, DS3, and DS4. Low inputs are provided by the Decoder Driver through a resistor network RN1 to the LED segments for construction of decimal numbers.

3-26. DECIMAL POINT. LED readouts DS2, DS3, and DS4 contain a decimal point segment. Illumination of a decimal point is controlled by the RANGE switch selected. This causes the resistor network RN2 to supply a negative voltage to the cathode of the decimal segment. Note on the schematic that the 20MΩ FUNCTION, which requires no RANGE selection, shares the 20 RANGE decimal point on DS2.

3-27. ANODE CONTROL. The Anode Control circuit, Q11 through Q18, applies 45 volts dc to the anodes of the LED readouts. Strobe pulses (S1 S2 S3 S4) from the Digital I.C. determine which readout receives the proper anode voltage at a particular time. The pulse sequence on the S lines is S1-S3-S2-S4 yielding a display sequence of DS1-DS3-DS2-DS4. For example, when S2 goes high Q12 and Q16 turn on and apply approximately 45 volts dc to the anodes of the LED segments on DS2. Those segments with negative voltages on their cathodes, at S2 time, will illuminate and form a decimal number.

3-28. LED READOUTS. The LED readouts DS2, DS3, and DS4 each contain seven and one-half diode segments. One-half segment for a decimal point and 7 segments to form decimal numbers. The number forming segments are designated A through G in each readout on the schematic.

3-29. Readout DS1 indicates the most significant digit (MSD) and polarity. Two segments form a numerical "1" and two segments to form the polarity signs. Control of the MSD "1" indication is separate from the other readouts. BCD information comes from the Z line during the S1 time period. When line Z is high during time S1, Q7, and Q9 turn on to allow the "1" segment to illuminate.

3-30. Signal Conditioning

3-31. INPUT VOLTAGE DIVIDER. Three series connected resistors (R1, R2, and R3) totaling 10 megohms are tapped to provide division ratios of 100 or 1000 to 1. Division ratios for each voltage range are tabulated in the schematic diagram, sheet 1.

3-32. Trimming capacitors are connected across the Input Voltage Divider to maintain a flat frequency response when used for ac voltages. High frequency compensation during calibration can be accomplished with variable trimmer capacitor C3.

3-33. CURRENT SHUNTS. The current shunts consist of resistors R44 through R48. Series connected resistors R44 through R47 are switched into the circuit, depending upon the RANGE selected. The resistor steps are 1000, 100, 10, and 1 ohms for the 0.2, 2, 20, and 200 milliampere ranges, respectively. A separate 100 milliohm four terminal shunt is used for the 2000 milliampere range.

3-34. The maximum voltage developed across a single shunt or combination for full range indication is 0.2 volts. Current overload protection above 2 amperes is provided by fuse F2. The shunts are protected against over-voltage by diodes CR9 through CR12.

3-35. AC CONVERTER. The AC Converter consists of a buffer and an active rectifier (refer to Figure 3-4). Transistor Q1, connected as a voltage follower, operates as a buffer for the active rectifier. The buffer output is applied as a voltage, e_{in}, to the non-inverting input of operational amplifier U1. Negative feedback causes the voltage at the inverting input to follow the non-inverting input, causing a current, e_{in} R2, through R2 to ground. Since diodes CR1 and CR2 conduct on alternate half cycles, one-half the average current flows through R1. The rectified voltage developed across R1 is filtered by R3 and C1 to produce the dc voltage required for the A/D Converter.

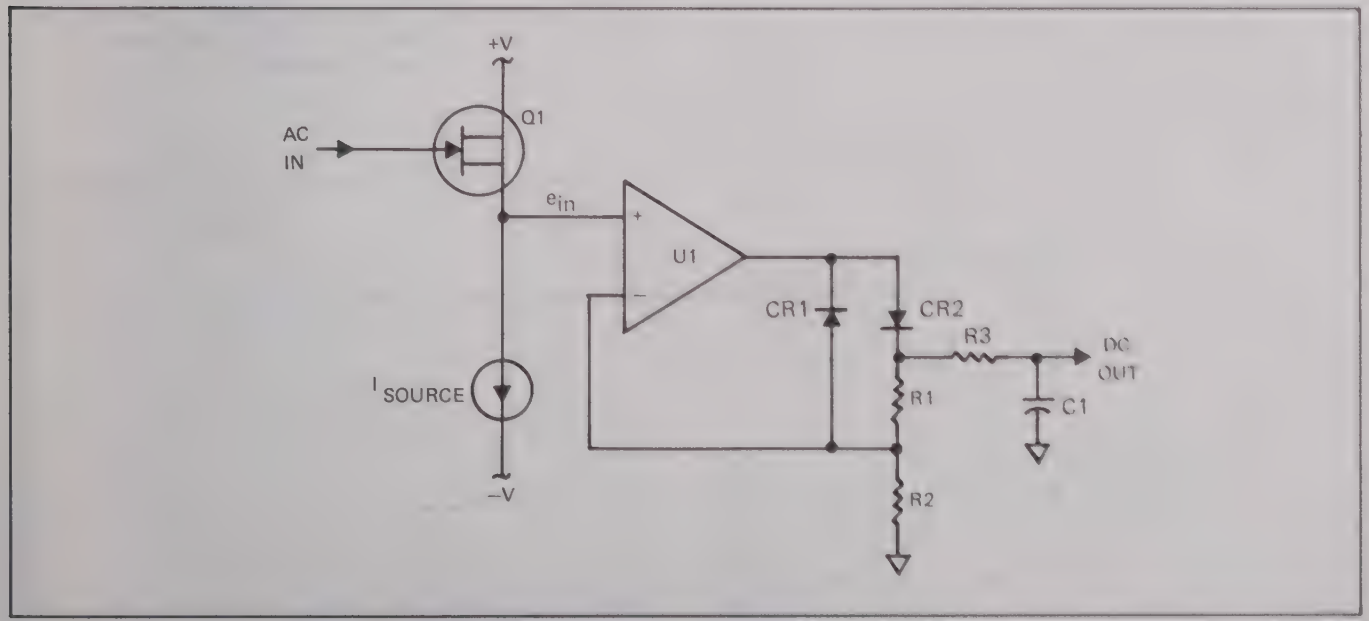


Figure 3-4. AC CONVERTER SIMPLIFIED DIAGRAM

3-36. The input to the AC Converter is in either the 0.2 volt or 2 volt basic range. To accommodate either range, the gain of the operational rectifier is adjusted accordingly by changing the feedback resistor (symbolized by R1). In the instrument, R51 sets the gain at 1 for the 2 volt basic range. For the 0.2 volt basic range, the gain is increased to 10 by switching R50 in parallel with R51.

3-37. OHMS CONVERTER. The Ohms Converter supplies a dc voltage, proportional to the unknown resistance, to the A/D Converter. A simplified diagram of the circuit elements involved is illustrated in Figure 3-5. Operational Amplifier U2 bootstraps the current source. With the non-inverting input connected to the junction of R_A and R_X, current will flow through R_A and R_X such that a constant voltage is maintained across R_A for a given RANGE. If R_X is within the RANGE selected, the voltage developed will be proportional to the value of R_X. For resistance ranges 200 ohms through 2000 kilohms, the constant voltage maintained is 10 volts. In the 20 megohm range, U2's feedback resistor, R_F, is changed so that a 1 volt potential is maintained.

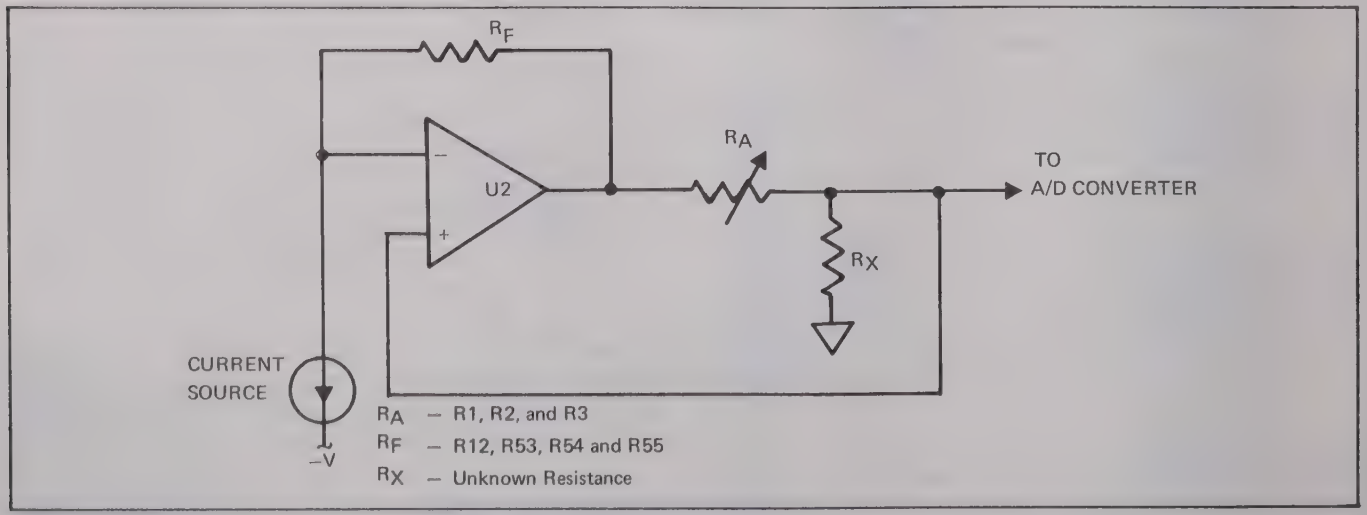


Figure 3-5. OHMS CONVERTER SIMPLIFIED DIAGRAM

3-38. ACTIVE FILTER. The Active Filter ensures that the input to the A/D Converter receives only dc voltages. The operational amplifier (U2) used for the Ohms Converter is also used in conjunction with R18, C11, R19, and C12 to form a two pole Bessel type active filter (see Figure 3-6). A cutoff frequency of 10Hz and a 60Hz rejection ratio of 32db is provided by this filter. Normal mode rejection at frequencies other than even multiples of the integration period is also provided. Overloading of the A/D Converter by large ripple voltages is prevented by the filter.

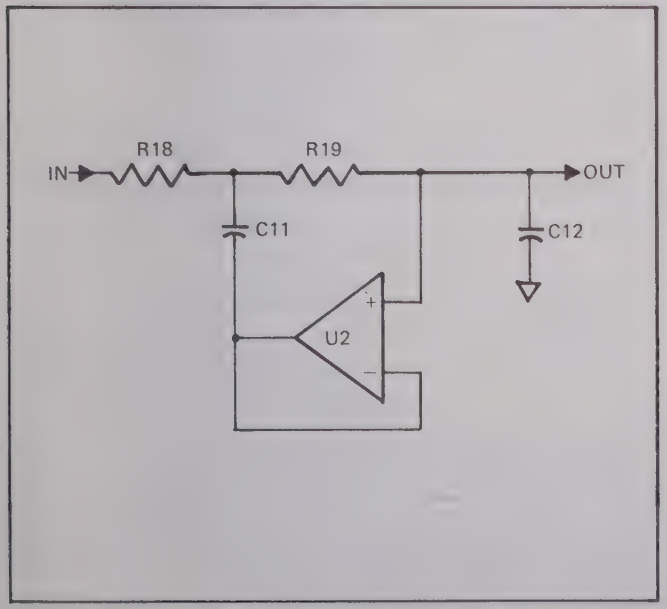


Figure 3-6. ACTIVE FILTER SIMPLIFIED DIAGRAM

3-39. Power Supply

3-40. LINE POWER. The line power supply, shown in sheet 2 of the schematic diagram, provides ±15 and +5 volts dc. Diode bridge CR15 through CR18 and filter capacitors C17 and C18 supply an unregulated +15 volts. Further conditioning by Q19, CR19, Q24, and CR8 provide the regulated ±15 volts dc. Diodes CR13 and CR14, and filter capacitor C19 supply an unregulated +5 volts.

3-41. BATTERY POWER. The Model 8000A 01 utilizes the battery operated power supply diagrammed on the schematic. With the POWER switch ON, the battery is connected to the input of the dc to dc converter consisting of Q22, Q23, T2, CR15 through CR18, C17, and C18. Transistors Q22 and Q23 and transformer T2 form a 4kHz multivibrator. The multivibrator signal is coupled by T2 to the diode rectifiers CR15 through CR18. Capacitors C17 and C18 filter the rectified voltage to supply the ±15 volts. The unregulated +5 volts is supplied by the battery. The battery is charged whenever the instrument is connected to ac line power. Transformer T1, CR13, and CR14 provide the rectified voltage. A lamp, DS5, in parallel with R21 acts as a dynamic current control that limits the charging current to approximately 450 milliamperes. With the instrument connected to line power and the POWER switch OFF, approximately 400 to 450 milliamperes can be supplied to a discharged battery.

3-42. DPOU (Option –02)

3-43. GENERAL. Digits, polarity, and overload data from the 8000A are applied to the WXYZ input lines of the DPOU. Most significant digit (MSD), overload and polarity data arrive at the beginning of each measurement cycle during the S1 strobe period. Information for second, third, and fourth digits arrives during the S2, S3, and S4 periods, respectively. This data is applied through buffers to a pair of dual 4-bit shift registers (see schematic 8000A–1012). Data is loaded and shifted when clock pulses, at S, are applied to the Cp inputs of the registers.

3-44. DATA TRANSFER SEQUENCE. Setting the Data Update line low causes U1-5 to go high. When the next $\overline{T}$ positive transistion occurs (see Timing Diagram, Figure 3-7), this high is transferred to U1-9. Occurance of the S1 strobe pulse causes a low at U1-12. This low is inverted to a high at U4-12 which causes a reverse bias condition across CR1. With CR1 reverse biased, the clock pulses from S are applied to the registers to allow loading of new data and shifting of previous data to the DPOU output. During this time the low at U1-12 is inverted by U8 to provide a Busy Flag. When the S4 period begins, an S4 pulse resets U1-4. At the end of the S4 period, an S4 pulse resets U1 at pin 4. This sets up U1-5 to accept another external command and cause the data transfer sequence to repeat. Should an S4 pulse occur before an S1 pulse, Diode CR2 will clamp this pulse and prevent the reset of U1-5. Continuous updating at the internal rate of the DPOU, six times per second, occurs when the Continuous Update line is held low.

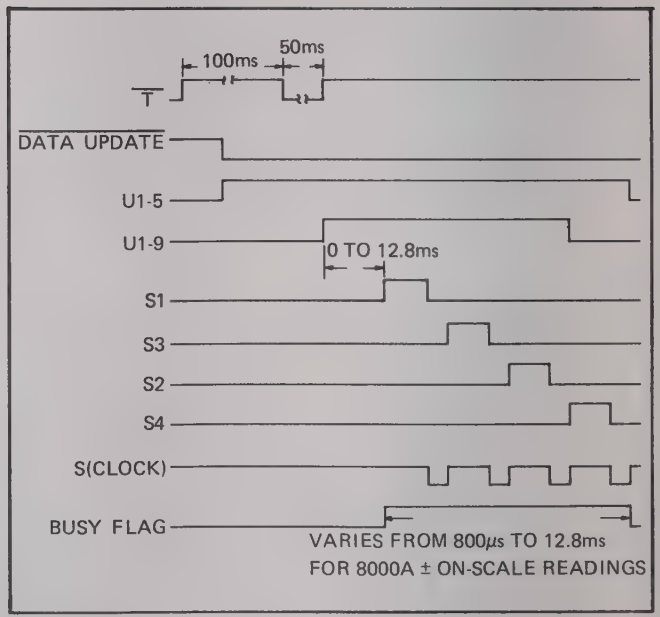


Figure 3-7. DPOU TIMING DIAGRAM

Section 4
Maintenance

4-1. INTRODUCTION

4-2. This section contains information concerning preventive and corrective maintenance for the Model 8000A Digital Multimeter. A maintenance interval of one year for calibration is recommended to ensure instrument operation within the one year specifications. Equipment for performing maintenance tests and adjustments is listed in Table 4-1. If this equipment is not available, other equipment having equivalent specifications may be used.

4-3. SERVICE INFORMATION

4-4. A unique 48 hour turnaround service is provided for the Model 8000A. Should your instrument need repair, send it to the nearest factory authorized service center. A list of these authorized service centers is located on the inside of the front cover. Also located on the inside front cover is the WARRANTY which warrants the instrument for a period of one year. In order for the warranty to become effective, the validation card included with the manual must be completed and returned to the John Fluke Mfg. Co., Inc.

Table 4-1. TEST EQUIPMENT

EQUIPMENT NOMENCLATURE	USE	SPECIFICATIONS	RECOMMENDED EQUIPMENT
DC Voltage Source	Calibration, Performance Checks, Troubleshooting	190mV to 1200V ±0.03%	Fluke Model 341A
DC Current Source	Calibration, Performance Checks	190μA to 1.9A ±0.1%	Fluke Model 382A
AC Voltage Source	Calibration, Performance Checks	190mV to 1200V (45Hz to 10kHz) ±0.1% 190mV to 1200V (10kHz to 20kHz) ±0.2%	Fluke Models 5200A/5205A
AC Current Source	Performance Checks	190μA to 190mA (100Hz to 10kHz) ±0.3% 1.9A (100Hz to 3kHz) ±0.3%	Optimation AC 105, and Fluke Models 540B, 382A, A45, and A40 shunts (20mA, 200mA, and 2A)
Resistors	Calibration	190Ω, 1.9kΩ, 19kΩ, 1.9MΩ, and 19MΩ ±0.1%	
Frequency Counter	Calibration	To measure positive 100 msec. pulse with 1μsec resolution	Fluke Model 1952A
Oscilloscope	Troubleshooting	General Purpose	Tektronix 545B W/1A1 plug-in

4-5. GENERAL MAINTENANCE

4-6. Access

4-7. Use the following procedure to gain access to the interior of the Model 8000A.

a. With the power switch OFF, disconnect the line cord.

b. Remove the Phillips screw at the rear of the instrument case.

c. Remove the instrument from the case.

4-8. Cleaning

4-9. Clean the front panel and case with denatured alcohol or mild solution of detergent and water. Do not use aromatic hydrocarbons or chlorinated solvents because they will react with the plastic materials of the instrument.

4-10. Fuse Replacement

4-11. The input power fuse, F1, is located within the instrument in a fuse clip near the power transformer (T1). To gain access to the fuse, refer to paragraph 4-6. When replacement is required, install AGC 1/8A (fast acting) for line powered instruments. Use MDL 1/8A (slow blow) for battery powered instruments.

4-12. The current shunt protection fuse, F2, is located behind the front panel. To remove the fuse, turn the MA input terminal in the direction indicated on the front panel. When replacement is required, install AGW2A as indicated on the front panel and on the decal on the underside of the instrument case.

4-13. Battery Replacement (Option 8000A–01)

4-14. Follow the disassembly instructions below for removing the replaceable batteries in the Model 8000A–01.

CAUTION!

Damage may result if alkaline, zinc-carbon or mercury batteries are charged.

a. Disconnect line cord. Remove retaining screw at rear of instrument case, and remove instrument from case.

b. On the underside of the PCB, remove the two threaded bolts securing the battery holders.

c. Remove the holder tops and batteries.

d. Replace the batteries with 1.2 volt nickel-cadmium batteries (JF Part No. 346924). Install the batteries in the polarity indicated on the battery holder.

4-15. Optional Modifications (Option 8000A–02)

4-16. READY FLAG

4-17. The DPOU can be modified to provide a Ready Flag in place of the Busy Flag. To modify the DPOU, use the following instructions:

a. Disconnect line cord. Remove retaining screw at rear of instrument case, and remove instrument from case.

b. Locate DPOU pcb (use Figure 5-3 for reference).

c. Locate and cut jumper wire at J1 (between U1 and RN2).

d. Complete modification by installing jumper wire at J2.

e. Install instrument in case.

4-18. Pin 13 of DPOU output connector will be the Ready Flag. Logic "1" will be ready and logic "0", not ready.

4-19. EXTERNAL PULLUP VOLTAGE

4-20. A pullup voltage to 15 volts maximum can be provided by modifying the DPOU. The modification allows connection of an external voltage source to pin 1 of the DPOU output connector. Follow the procedure below for modifying the DPOU.

a. Disconnect line cord. Remove retaining screw at rear of instrument case, and remove instrument from case.

b. Locate DPOU pcb (use Figure 5-3 for reference).

c. Locate and cut jumper wire at J3 (near RN3, R5, and R7).

d. Complete modification by installing jumper wire at J4.

e. Install instrument in case.

4-21. PERFORMANCE CHECKS

4-22. Environmental Conditions

4-23. The environmental conditions for conducting the performance checks are as follows:

a. Ambient Temperature, 22°C to 25°C (72°F to 77°F)

b. Relative Humidity, less than 70%

4-24. Zero Offset Checks

a. With instrument energized, depress DCV and 200MV pushbuttons.

b. Short V–Ω to COMMON. Readout should indicate 00.0, flashing ±00.1 not more than 10 times in 10 seconds.

c. Remove short. Readout should indicate less than or equal to ±01.0.

4-25. Accuracy Checks

4-26. The accuracy checks compare the instruments performance to the accuracy specifications listed in Section 1. Use Table 4-3, disregarding the "ADJUSTMENT" column, since the display limits for a given input are listed. For the AC current performance checks, refer to Table 4-2, AC MA PERFORMANCE CHECKS.

Table 4-2. AC MA PERFORMANCE CHECKS

FUNCTION/RANGE	INPUT	DISPLAY LIMITS
AC MA/200μA	190μA @ 100 Hz	187.9 to 192.1
AC MA/200μA	190μA @ 10 kHz	187.9 to 192.1
AC MA/2	1.9mA @ 100 Hz	1.879 to 1.921
AC MA/2	1.9 mA @ 10 kHz	1.879 to 1.921
AC MA/20	19 mA @ 100 Hz	18.79 to 19.21
AC MA/20	19 mA @ 10 kHz	18.79 to 19.21
AC MA/200	190 mA @ 100 Hz	187.9 to 192.1
AC MA/200	190 mA @ 10 kHz	187.9 to 192.1
AC MA/2000 MA	1.9 A @ 100 Hz	1879 to 1921
AC MA/2000 MA	1.9A @ 3 kHz	1879 to 1921

4-27. CALIBRATION

4-28. Environmental Conditions

4-29. Instrument calibration should be accomplished within the following environmental conditions.

a. Ambient Temperature, 22°C to 25°C (72°F to 77°F)

b. Relative Humidity, less than 70%

4-30. Period Adjustment

a. Connect a frequency counter, set for time interval measurement, between TP5 (see Figure 4-1) and COMMON (or TP4).

b. Adjust R20, PERIOD, for a 100,000 microsecond indication on counter ±5 microseconds. Variation in the indication should be less than or equal to ±15 microseconds.

4-31. Zero Offset (Use Code C)

4-32. Use the following procedure for instruments with serial numbers listed under Use Code C. Refer to Table 5-1, Section 5, for these numbers.

a. Disconnect line cord. Remove retaining screw at rear of instrument case, and remove instrument from case.

b. Connect instrument to line power and select DCV and 200 MV pushbuttons.

WARNING!

Instrument power connector is at line potential (100, 115, or 230 volts ac). Use caution when working in this area.

c. Short V–Ω to COMMON.

d. Readout should indicate 00.0, flashing ±00.1 not more than 10 times in 10 seconds.

e. Remove INPUT short. Readout should indicate less than or equal to ±01.0.

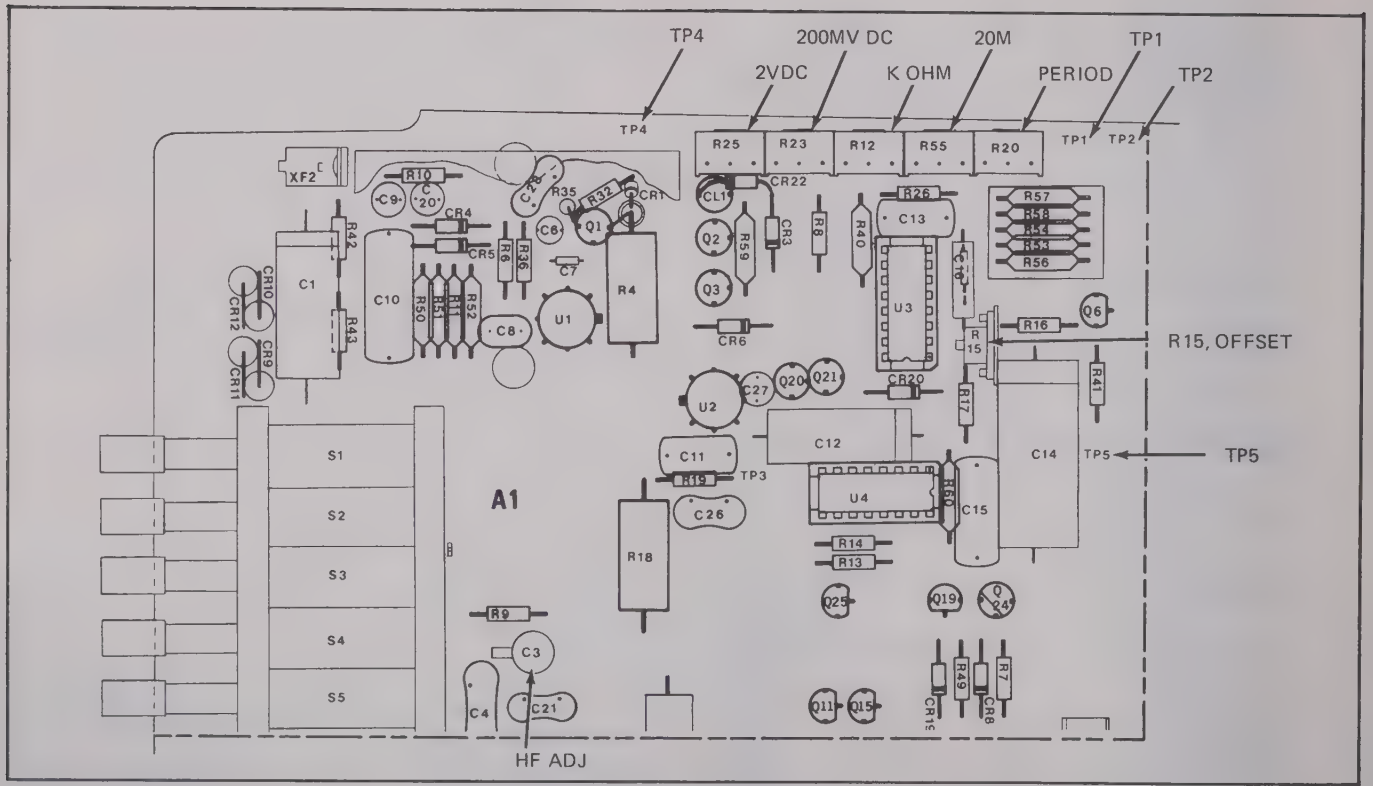


Figure 4-1. ADJUSTMENT AND TEST POINT LOCATIONS

4-33. Zero Offset (Use Code D)

4-34. Use the following procedure for instruments with serial numbers listed under Use Code D. Refer to Table 5-1, Section 5, for these numbers.

a. Disconnect line cord. Remove retaining screw at rear of instrument case, and remove instrument from case.

b. Connect instrument to line power and select DCV and 200 MV pushbuttons.

WARNING!

Instrument power connector is at line potential (100, 115, or 230 volts ac). Use caution when working in this area.

c. Short V–Ω to COMMON.

d. Readout should indicate 00.0, flashing ±00.1 not more than 10 times in 10 seconds. If instrument meets these limits, go to step f. If instrument does not meet these limits, complete steps e and f.

e. Adjust R15 (for location, see Figure 4-1) for readout of 00.0, flashing ±00.1 not more than 10 times in 10 seconds.

f. Remove INPUT short. Readout should indicate less than or equal to ±01.0.

4-35. Turn-Over Error (Use Code C)

4-36. Use the following procedure for instruments with serial numbers listed under Use Code C. Refer to Table 5-1, Section 5, for these numbers.

a. Select VDC and 200 MV pushbuttons and apply +190 millivolts between V–Ω and COMMON terminals.

b. Adjust R25 (for location, see Figure 4-1) for +190.0 on readout.

c. Remove +190 millivolt input and apply –190 millivolts.

d. Instrument should indicate within +190.1 to –190.1 on readout.

4-37. Turn-Over Error (Use Code D)

4-38. Use the following procedure for instruments with serial numbers listed under Use Code D. Refer to Table 5-1, Section 5, for these numbers.

a. Follow steps a through d of paragraph 4-36.

b. If instrument is within limits of paragraph 4-36, step d, proceed to paragraph 4-39, Range Adjustments/Checks. If not within limits, continue with the following steps.

c. Change offset adjustment, R15, to bring instrument within +190.1 to –190.1 on readout.

d. Recheck Zero Offset (Use Code D), paragraph 4-33.

4-39. Range Adjustments/Checks

4-40. Refer to Figure 4-1 for the location of range adjustments. Table 4-3 lists the order of the adjustments and cardinal check points. Apply the inputs listed, adjust and check for in-limits indications.

4-41. Troubleshooting

4-42. Insure that the malfunction is within the instrument and not due to operator error, faulty test leads, etc. Careful observation of the front panel, while actuating controls, can aid in localizing a problem area to one

Table 4-3. CALIBRATION

FUNCTION/RANGE	INPUT	ADJUSTMENT	DISPLAY LIMITS
DCV / 200 MV	+190 MV	"200 MVDC" (R23) Adjust for +190.0	+189.7 to +190.3
DCV / 2	+1.9V dc	"2 VDC" (R25) Adjust for +1.900	+1.897 to +1.903
DCV / 20	+19V dc	--------	+18.97 to +19.03
DCV / 200	+190V dc	--------	+189.7 to +190.3
DCV / 1200V	+1000V dc	--------	+998 to +1002
20MΩ	19MΩ	"20 M" (R55) Adjust for 19.00	18.89 to 19.11
KΩ / 20	19KΩ	"K OHM" (R12) Adjust for 19.00	18.95 to 19.05
KΩ / 200Ω	190Ω	--------	189.5 to 190.5
KΩ / 2	1.9KΩ	--------	1.895 to 1.905
KΩ / 200	190KΩ	--------	189.5 to 190.5
KΩ /2000KΩ	1.9MΩ	--------	1895 to 1905

FUNCTION/RANGE	INPUT	ADJUSTMENT	DISPLAY LIMITS
DC MA / 200μA	+190μA	--------	+189.3 to +190.7
DC MA / 2	+1.9mA	--------	+1.893 to +1.907
DC MA / 20	+19mA	--------	+18.93 to +19.07
DC MA / 200	+190mA	--------	+189.3 to +190.7
DC MA / 2000 MA	+1.9A	--------	+1893 to 1907
ACV / 200 MV	190mV @ 100Hz	--------	188.8 to 191.2
ACV / 200 MV	190mV @ 20kHz	--------	1879 to 192.1
ACV / 2	1.9V @ 100 Hz	--------	1.888 to 1.912
ACV / 2	1.9V @ 20kHz	--------	1.879 to 1.921
ACV / 20	19V @ 20kHz	"HF ADJ" (C3) Adjust for 19.00	18.79 to 19.21
ACV / 20	19V @ 10 kHz	--------	18.79 to 19.21
ACV / 200	190V @ 10 kHz	--------	187.9 to 192.1
ACV / 200	190 @ 20 kHz	--------	187.9 to 192.1
ACV / 1200V	1000V @ 100 Hz	--------	983 to 1007
ACV / 1200V	1000V @ 10 kHz	--------	988 to 1012

of the five functions. A troubleshooting procedure for isolating an incomplete display problem is described in Figure 4-2.

4-43. Component Replacement

4-44. There are three matched component sets in the Model 8000A instruments. These are the Input Divider Resistor Set, Analog Resistor Set, and Ohms Resistor Set. When replacement is required, the complete set must be replaced.

4-45. Analog I.C.'s and Digital I.C.'s received as replacements are packed in conductive foam to protect them from damage by static discharge. These components should not be removed from the conductive foam until needed for replacement. At that time, personnel handling the devices and the working surface must be grounded.

CAUTION!

When soldering or desoldering on the Model 8000A–01 PCB, either remove one of the batteries or place a thin insulating material between a battery and the holder contact.

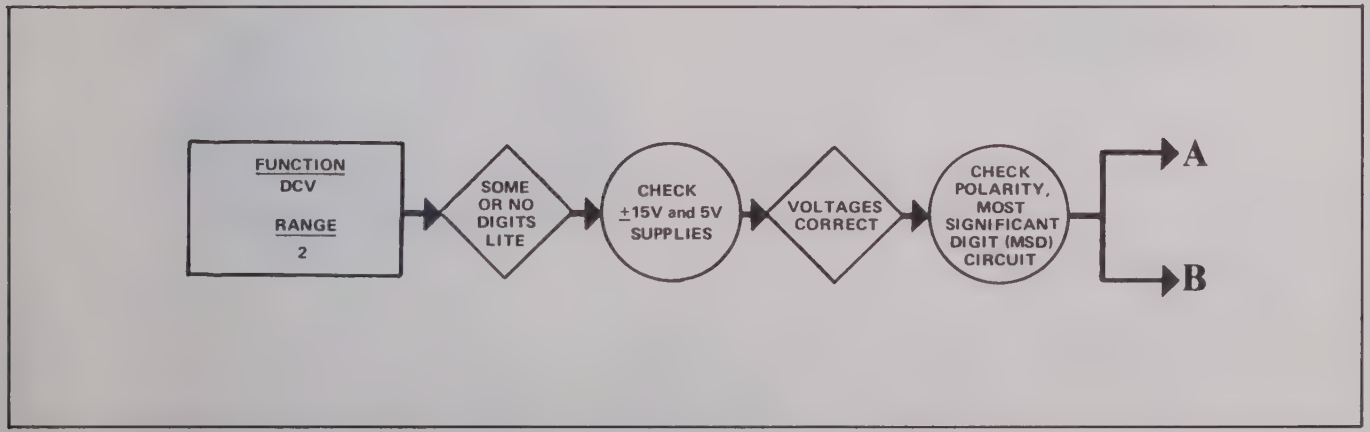


Figure 4-2. TROUBLESHOOTING CHART (1 of 2)

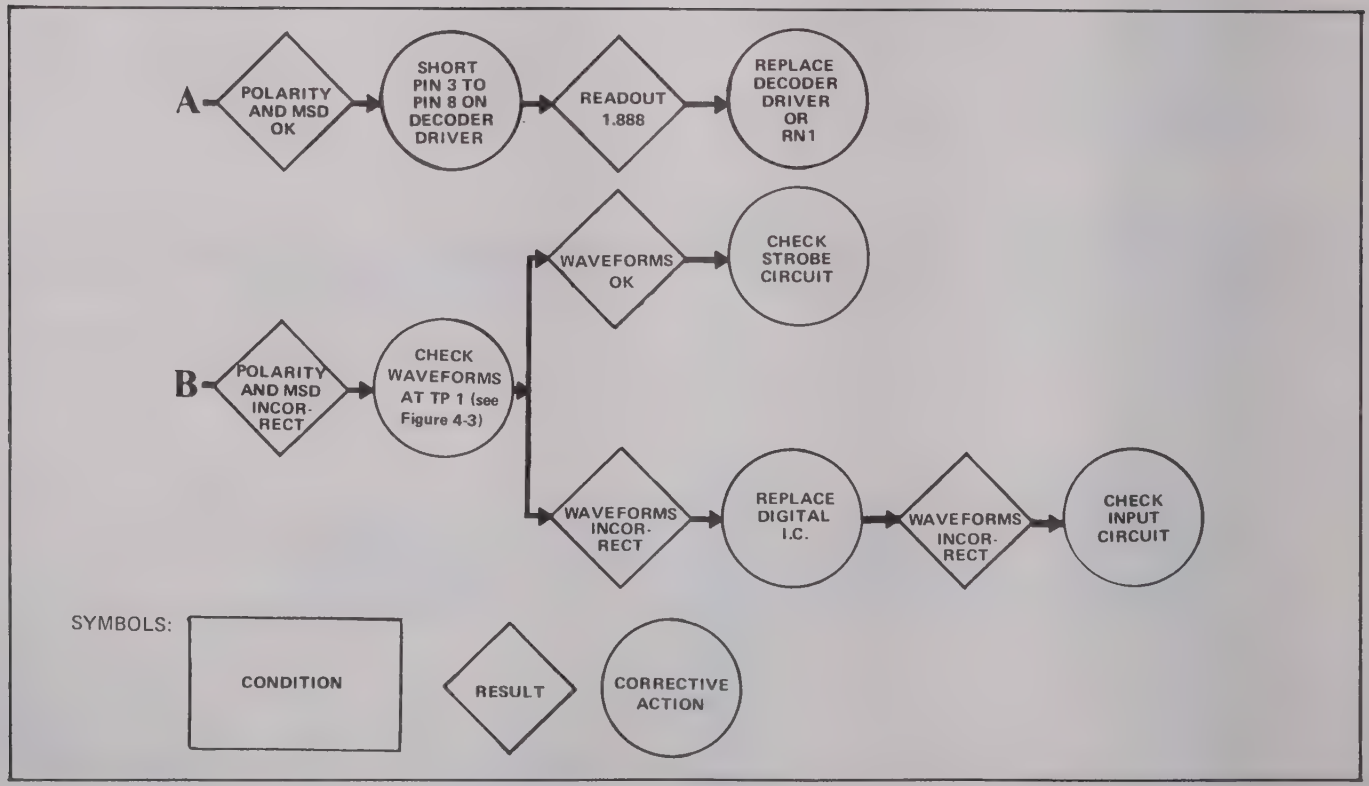
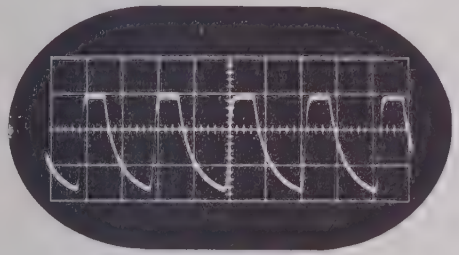
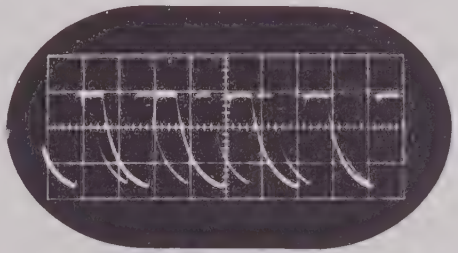


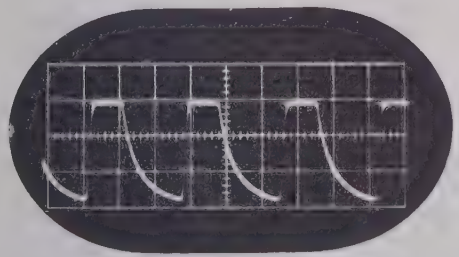
Figure 4-2. TROUBLESHOOTING CHART (2 of 2)



ZERO INPUT



— INPUT VOLTAGE
CAUSES INCREASE
IN FREQUENCY
FROM ANALOG I.C.



+ INPUT VOLTAGE
CAUSES DECREASE
IN FREQUENCY
FROM ANALOG I.C.

SCOPE SWITCH SETTINGS

COUPLING	TRIGGER	HORZ	VERT
AC	–AC	5μsec/cm	5V/cm

Figure 4-3. TP1, OSCILLOSCOPE WAVEFORMS

Section 5
Lists of Replaceable Parts

5-1. INTRODUCTION

5-2. The parts list contains a complete breakdown of all the major assemblies followed by subsequent listings that itemize the components on each major assembly. Assemblies and subassemblies are identified by a reference designation beginning with the letter A followed by a number (e.g., A1 etc.). Electrical components appearing on the schematic diagram are identified by their schematic diagram reference designation. Flagnotes are used throughout the parts list and refer to special ordering explanations.

5-3. COLUMN DESCRIPTION

a. REF DESIG: indexes the item description to the associated illustration.

b. DESCRIPTION: describes the salient characteristics of the component. Indention of the description indicates the relationship to other assemblies, components, etc. Those component descriptions that are unique to a particular model are designated by the model number in paranthesis following the description, such as (8000A –01).

c. STOCK NO: the six-digit part number by which the item is identified at the John Fluke Mfg. Co.

d. MFR: the Federal Supply Code for the manufacturer. Appendix A lists the code numbers and the corresponding manufacturer.

e. MFR PART NO: part number by which the item is identified by the manufacturer.

f. TOT QTY: lists the total quantity of the item and reflects the latest Use Code. Second and subsequent listings of the same item are referenced to the first listing with the abbreviation REF.

g. REC QTY: indicates the recommended number of spare parts necessary to support one to five instruments for a period of two years. This list presumes an availability of common electronic parts at the maintenance site.

h. USE CODE: identifies certain parts which have been added, deleted or modified during the production of the instrument. Each part for which a Use Code has been assigned may be identified with a particular instrument serial number by consulting the Serial Number Effectivity List, Table 5-1. All parts with no code are used on all instruments with serial numbers above 123.

5-4. HOW TO OBTAIN PARTS

5-5. Standard components may be ordered directly from the manufacturer's part number, or parts may be ordered from the John Fluke Mfg. Co. factory or authorized representative by using the Fluke part number. In the event the part you order has been replaced by a new or improved part, the replacement will be accompanied by an explanatory note and installation instructions, if necessary.

5-6. You can insure prompt and efficient handling of your order to the John Fluke Mfg. Co. if you include the following information: Quantity, FLUKE Stock Number, Description, Reference Designation and Instrument model and serial number. If you must order structural parts not listed in the parts list, describe the part as completely as possible.

Table 5-1. SERIAL NUMBER EFFECTIVITY LIST.

USE CODE	SERIAL NUMBER EFFECTIVITY
A	56400 and on
B	62300 and on
C	123 thru 644330, 64390 thru 66244, and 66845 thru 67784
D	64340 thru 64389, 66245 thru 66844, 67785 and on
E	60700 and on

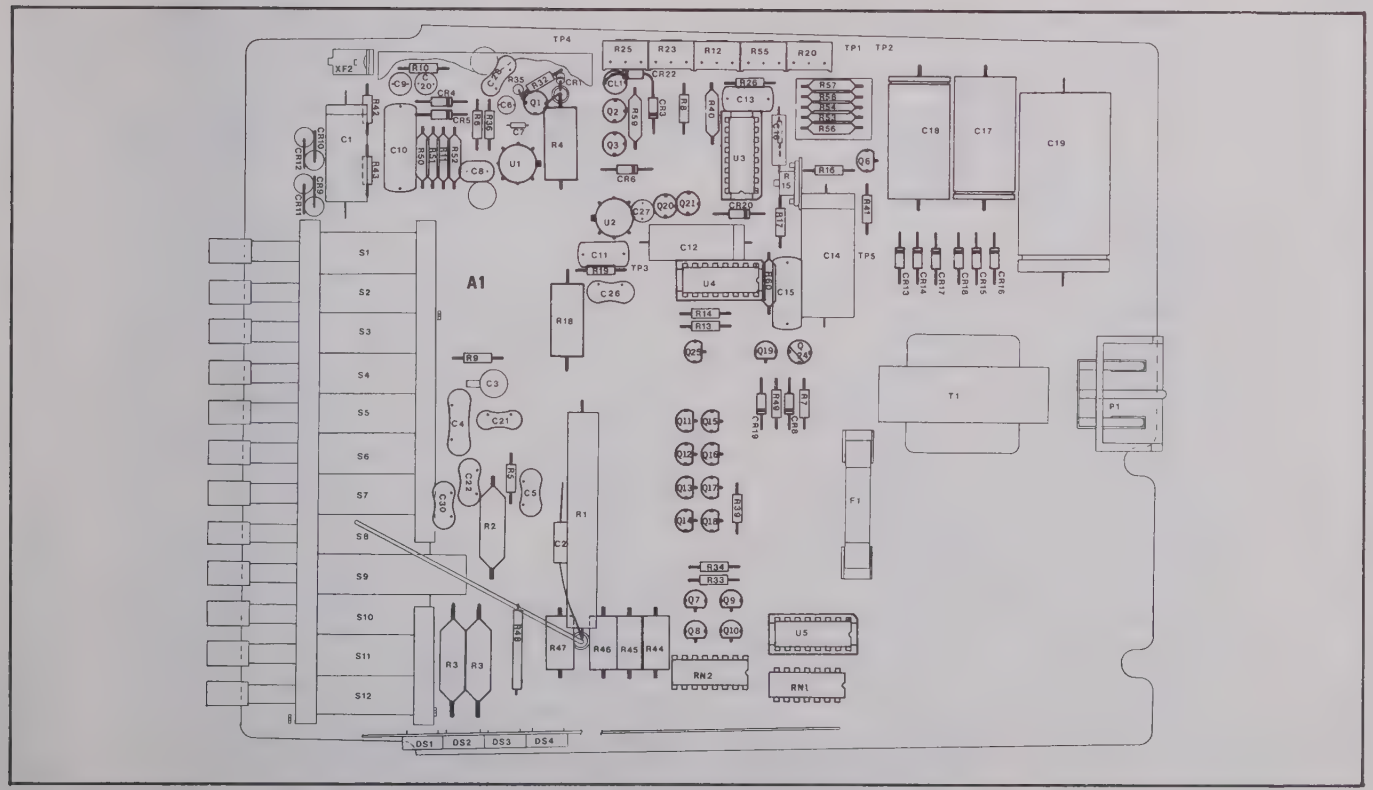


Figure 5-1. 8000A MAIN PCB ASSEMBLY

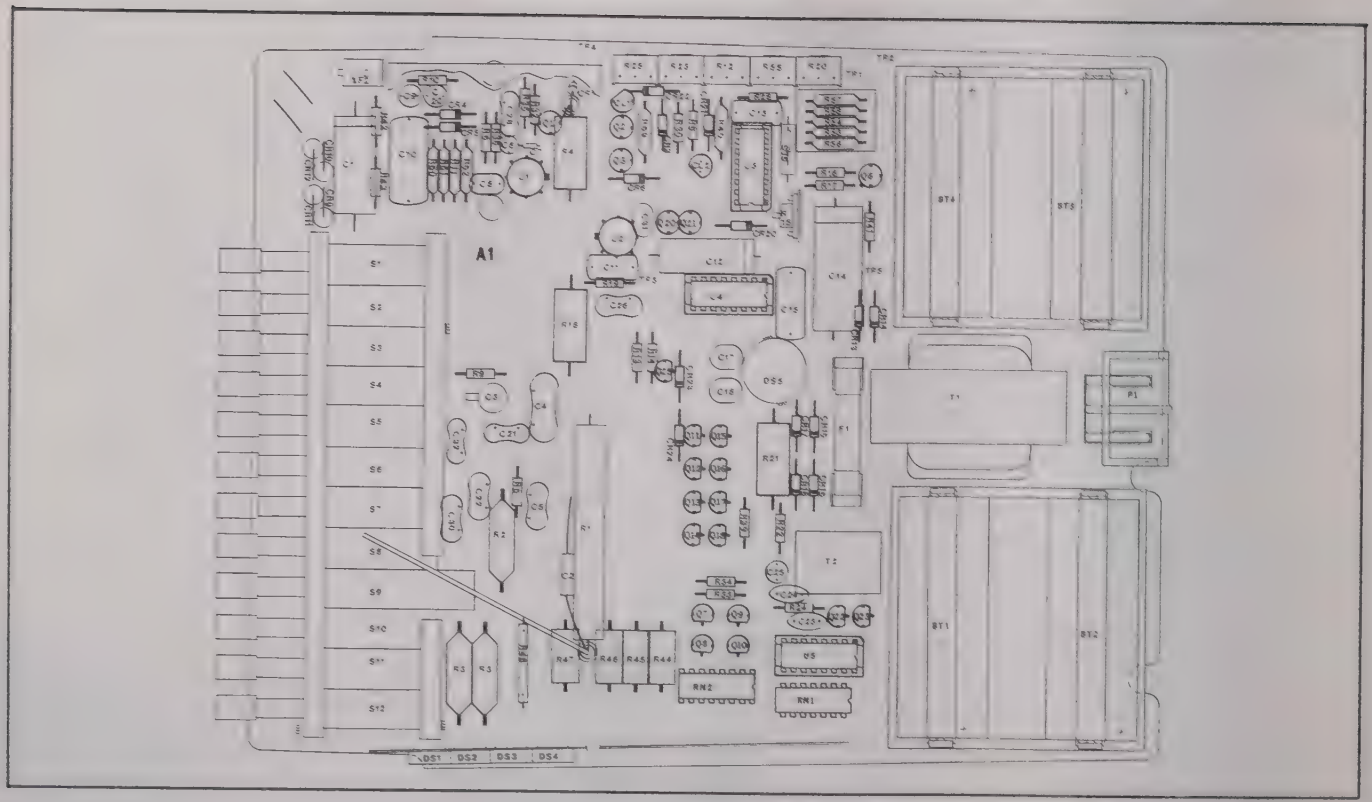


Figure 5-2. 8000A–01 MAIN PCB ASSEMBLY

8000A DIGITAL MULTIMETER INSTRUCTION MANUAL

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
	8000A DIGITAL MULTIMETER INSTRUCTION MANUAL	347906	89536	347906	1		
	DIGITAL MULTIMETER Figure 5-1 & Figure 5-2	8000A & 8000A -01					
A1	Main PCB Assembly (8000A)	364562	89536	364562	1		
	Main PCB Assembly (8000A/10)	364588	89536	364588	1		
	Main PCB Assembly (8000A/23)	346114	89536	346114	1		
	Main PCB Assembly (8000A-01)	364570	89536	364570	1		
	Main PCB Assembly (8000A-01/10)	364596	89536	364570	1		
	Main PCB Assembly (8000A-01/23)	346098	89536	364089	1		
A2	Front Panel Assembly	---	--	---			
A3	Display Assembly	338376	89536	338376	1		
	Case, molded	330076	89536	330076	1		
	Handle, molded	330092	89536	330092	1		
	Line Cord Assembly	343723	89536	343723	1		
	Line Cord Assembly (/10 & /23 only)	343780	89536	343780	1		
	Pad, foot	338632	89536	338632	4		
	Test Lead Set	343657	89536	343657	1		
A1	**MAIN PCB ASSEMBLY**	REF					
BT1	Battery, Ni Cd, 1.2V (8000A-01)	346924	89536	346924	4		
BT2	Battery, Ni Cd, 1.2V (8000A-01)	346924	89536	346924	REF		
BT3	Battery, NiCd, 1.2V (8000A-01)	346924	89536	346924	REF		
BT4	Battery, Ni Cd, 1.2V (8000A-01)	346924	89536	346924	REF		
C1	Cap, plstc, 0.033μf, 1200V	352120	01281	JF83	1		
C2	Cap, porcelain, 5.1pf 1V	347948	89536	347948	1		
C3	Cap, var, cer, 4.5 to 50pf + 70/-20%	321117	73899	DVJ305A	1	1	
C4	Cap, mica, 560pf ±5%, 500V	170431	14655	CD19F561J	1		C
C4	Cap, mica, 510pf ±5% 500V	148411	14655	CD19F510J	1		D
C5	Cap, mica, 56pf ±5%, 500V	148528	14655	CD15F560J	1		

8000A DIGITAL MULTIMETER INSTRUCTION MANUAL

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
C6	Cap, ta, 0.22μf, +20% 35V	161331	56289	196D224X0035	1		
C7	Cap, cer, 33pf, +20%, 100V	354852	80031	2222-638-10339	1		
C8	Cap, ta 68μf ±10%, 15V	193615	56289	196D686X0015	1		
C9	Cap, ta, 10μf ±20%	330662	12954	D10GSB20M	3		
C10	Cap, plstc, 0.07μf ±10%, 250V	184366	73445	C280AE/A470K	1		
C11	Cap, plstc, 0.033μf ±10%, 50V	271841	06001	75F1R5A334	1		
C12	Cap, poly, 0.022μf ±10%, 100V	333823	02799	1P1223K	1		
C13	Cap, plstc, 0.047μf ±10%, 250V	271858	06001	75F1R5A474	1		
C14	Cap, fxd, poly, 0.22μf ±5%, 50	348359	13934	HS80R22350 V5PCT	1		
C15	Cap, plstc, 0.22μf ±10%, 250V	194803	73445	C280AE/A220K V5PCT	REF		
C16	Cap, cer, 390pf ±5%, 50V	352880	72982	8045-C0G039J	1		
C17	Cap, elect, 470μf, -10% +50%, 25V (8000A)	168153	73445	ET471X025A01	2	1	
C17	Cap, ta, 47μf ±20%, 20V (8000A -01)	348516	56289	196D476X0020 LA3	2		
C18	Cap, elect, 470μf, -10% +50%, 25V (8000A)	168153	73445	ET471X025A01	REF		
C18	Cap, ta, 47μf ±20%, 20V (8000A-01)	348516	56289	196D476X0020 LA3	REF		
C19	Cap, elect, 4000μf, 500mA, 10V (8000A)	330761	99392	61C10A543	1	1	
C20	Cap, ta, 10μf ±20%	330662	12954	D10GSB20M	REF		
C21	Cap, mica, 39pf ±5%, 500V	148544	14655	CD15E390J	2		
C22	Cap, mica, 390pf ±5%, 500V	148437	14655	CD15F391J	1		
C23	Cap, cer, 0.001μf ±10%, 500V (8000A-01)	357806	71590	CF122	2		
C24	Cap, cer, 0.001μf ±10%, 500V (8000A-01)	357806	71590	CF122	REF		
C25	Cap, ta, 10μf ±20% (8000A-01)	330662	12954	D10GSB20M	REF		
C26	Cap, mica, 100pf ±5%, 500V	148494	14655	CD15F101J	1		
C27	Cap, ta, 10μf ±20% (8000A)	330662	12954	C10GSB20M	REF		

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REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
CR14	Diode, si, 150mA (8000A–01)	203323	03508	DHD1105	REF		C
CR14	Diode, si, rectifier, 1 amp (8000A–01)	343491	11711	1N4002	REF		D
CR15	Diode, si, rectifier, 1 amp (8000A)	343491	11711	1N4002	REF		
CR15	Diode, si, 150mA (8000A–01)	203323	03508	DHD1105	REF		
CR16	Diode, si, rectifier, 1 amp (8000A)	343491	11711	1N4002	REF		
CR16	Diode, si, 150mA (8000A–01)	203323	03508	DHD1105	REF		
CR17	Diode, si, rectifier, 1 amp (8000A)	343491	11711	1N4002	REF		
CR17	Diode, si, 150mA (8000A -01)	203323	03508	DHD1105	REF		
CR18	Diode, si, rectifier, 1 amp (8000A)	343491	11711	1N4002	REF		
CR18	Diode, si, 150mA (8000A -01)	203323	03508	DHD1105	REF		
CR19	Diode, zener, 15V ±5% (8000A)	352377	03877	SV4823	REF		
CR20	Part of matched set, see 1	———	——	———			
CR21	Diode, zener, 6.8V +5% (8000A -01) (may not be included)	352898	89536	352898	1		
CR22	Diode, si, sm/sig	348177	03508	DA2429	REF		B
DS5	Lamp, GE63 (8000A -01)	352237	08806	63	1	1	
F1	Fuse, fast acting, 1/8 amp 250V (8000A)	196790	71400	TYPE AGC	1	5	
F1	Fuse, slo blo, 1/8 amp 250V (8000A -01)	166488	71400	TYPE MDL	1	5	
XF1	Fuse clip	284984	89536	284984	1		
XF2	Fuse contact	338665	89536	338665	1		
P1	Plug, power, 3 prong	———	——	———			
	Contact, voltage	338657	89536	338657	2		
	Contact, earth common	338640	89536	338640	1		
	Insulator, line contact (8000A)	338624	89536	338624	1		
	Insulator, line contact (8000A–01)	344184	89536	344184	1		
Q1	Xstr, FET, N-Channel	288324	15818	U2412	1	1	C
Q1	Xstr, FET, N-Channel	352112	15818	U2610F	1	1	D
Q2	Xstr, si, NPN	168716	07263	519254	2	1	
Q3	Xstr, si, NPN	168716	07263	519254	REF		
Q4	Not used						
Q5	Not used						

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REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
C28	Cap, mica, 22pf ±5%, 500V	148551	14655	CD15E220J	1		
C29	Not used						
C30	Cap, mica, 240pf, ±5%, 500V (8000A–01)	362863	14655	CD15E241J	1		D
C31	Cap, ta, 47µf, ±20% (8000A–01)	348516	56289	1960476X002 LA2	REF		A
C32	Cap, mica, 39pf, ±5%, 500V	148544	14655	CD15E390J	REF		
CL1	Diode, FED, cur. reg, 1000mA +20%	348482	17856	ES05	2	1	
CL2	Diode, FED. cur. reg, 1000mA ±20% (8000A -01)	348482	17856	ES05	REF		
CR1	Diode, si, 75mA, 25V piv	241422	03508	1N4009	4	1	C
CR1	Diode, si, sm/sig	348177	03508	DA2429	4	2	D
CR2	Diode, zener, 10V ±5%	246611	07910	1N961B	1	1	C
CR3	Diode, part of matched set, See 2	———	— —	———			
CR4	Diode, si, 75mA, 25V piv	241422	03508	1N4009	REF		C
CR4	Diode, si, sm/sig	348177	03508	DA2429	REF		D
CR5	Diode, si, 75mA, 25V piv	241422	03508	1N4009	REF		C
CR5	Diode, si, sm/sig	348177	03508	DA2429	REF		D
CR6	Diode, si, rectifier, 1 amp	343491	11711	1N4002	8	2	C
CR6	Diode, zener, 400 MW, 15V	246033	07910	1N965A	1	1	D
CR7	Diode, si, rectifier, 1 amp	343491	11711	1N4002	REF		C
CR8	Diode, zener, 15V, ±5%	352377	03877	SV4823	2	1	
CR9	Diode, si, rectifier, 2 amp, 50V	347559	14099	1N5400	4	1	
CR10	Diode, si, rectifier, 2 amp, 50V	347559	14099	1N5400	REF		
CR11	Diode, si, rectifier, 2 amp, 50V	347559	14099	1N5400	REF		
CR12	Diode, si, rectifier, 2 amp, 50V	347559	14099	1N5400	REF		
CR13	Diode, si, rectifier, 1 amp (8000A)	343491	11711	1N4002	REF		
CR13	Diode, si, 150mA (8000A–01)	203323	03508	DHD1105	6	2	C
CR13	Diode, si, rectifier, 1 amp (8000A -01)	343491	11711	1N4002	REF		D
CR14	Diode, si, rectifier, 1 amp (8000A)	343491	11711	1N4002	REF		

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
Q6	Xstr, si, PNP	288761	07933	RS2048	1	1	
Q7	Sxtr, si, NPN	218396	04713	2N3904	8	2	
Q8	Xstr, si, NPN	218376	04713	2N3904	REF		
Q9	Xstr, si, NPN	218396	04713	2N3904	REF		
Q10	Xstr, si, NPN	218396	04713	2N3904	REF		
Q11	Xstr, si, PNP	340026	04713	MPS6563	3	1	
Q12	Xstr, si, PNP	340026	04713	MPS6563	REF		
Q13	Xstr, si, PNP	340026	04713	MPS6563	REF		
Q14	Xstr, si, PNP	340026	04713	MPS6563	REF		
Q15	Xstr, si, NPN	218396	04713	2N3904	REF		
Q16	Xstr, si, NPN	218396	04713	2N3904	REF		
Q17	Xstr, si, NPN	218396	04713	2N3904	REF		
Q18	Xstr, si, NPN	218396	04713	2N3904	REF		
Q19	Xstr, si, PNP (8000A)	352369	04713	2N4403	1	1	
Q20	Xstr, si, NPN	352138	89536	352138	1	1	
Q21	Xstr, si, PNP	352146	89536	352146	1	1	
Q22	Xstr, si, NPN (8000A–01)	330803	07263	MPS6560	2	1	
Q23	Xstr, si, NPN (8000A–01)	330803	07263	MPS6560	REF		
Q24	Xstr, si, NPN	168708	03508	2N3391	1	1	
Q25	Xstr, FET, N-Channel	261388	04713	SPF179	1	1	
R1	Part of matched set, see ③	— — —	— —	— — —			
R2	Part of matched set, see ③	— — —	— —	— — —			
R3	Part of matched set, see ③	— — —	— —	— — —			
R4	Res, comp, 100k ±10%, 2W	158659	01121	HB1041	1		
R5	Res, comp, 680k ±5%, ¼W	188433	01121	CB6845	1		C
R5	Res, comp, 1M, ±5%, ¼W	182204	01121	CB1055	1		D
R6	Res, comp, 4.7M ±5%, ¼W	220046	01121	CB4755	1		
R7	Res, car dep, 1k ±5%, ¼W	343426	TOYO	R251025	3		
R8	Res, car dep, 1k ±5%, ¼W	343426	TOYO	R251025	REF		

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REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
R9	Res, comp, 10k, ±5%, ¼W	148106	01121	CB1035	1		
R10	Res, car dep, 470k ±5%, ¼W	342634	TOYO	R254715	3		
R11	Res, met flm, 10k ±1%, 1/8W	168260	91637	MFF1-81012F	1		
R12	Res, var, cermet, 500Ω ±10%, 1W	291120	71450	360S501A	1	1	
R13	Res, comp, 39k ±5%, ¼W	188466	01121	CB3935	1		
R14	Res, comp, 3.3k ±5%, ¼W	148056	01121	CB6825	1		
R15	Res, var, 50k ±30%, ¼W	358127	71450	X201503	1	1	
R16	Res, comp, 82k ±5%, ¼W	188458	01121	CB8235	1		
R17	Res, nickel flm, 1Ω ±5%, ¼W	357665	TOYO	R251005	1	1	
R18	Res, comp, 470k +10%, 2W	110247	01121	CB4745	1		
R19	Res, fxd, car dep, 560k ±5%, 1/3W	342642	TOYO	R331-35645	1		
R20	Res, var, cermet, 20k ±10%, ½W	291609	71450	360S203A	1	1	
R21	Res, comp, 22Ω ±5%, 2W (8000A–01)	352229	01121	HB2205	1		
R22	Res, comp, 330Ω ±5%, ¼W (8000A–01)	147967	01121	CB3315	1		
R23	Res, var, cermet, 100Ω ±10%, 1W	285130	71450	360S101A	1	1	
R24	Res, comp, 82Ω ±5%, ¼W (8000A–01)	149484	01121	CB8205	1		
R25	Res, var, cermet, 1k ±10%, ½W	285155	71450	3605102A	1	1	
R26	Res, comp, 150k +5%, ¼W	182212	01121	CB1545	1		
R27	Not Used						
R28	Not used						
R29	Not used						
R30	Res, comp, 6.8k ±5%, ¼W (8000A–01) (May not be included)	148098	01121	CB6825	1		
R31	Not used						
R32	Res, comp, 2.2k ±10%, 1/8W	153965	01121	BB2228	1		B
R33	Res, car dep, 3.9k ±5%, ¼W	342600	TOYO	R253R925	3		
R34	Res, car dep, 3.9k ±5%, 1/3W	342600	TOYO	R331-33925	REF		
R35	Res, comp, 20k ±5%, ¼W	221614	01121	CB2035	1		
R36	Res, comp, 30k ±5%, ¼W	193417	01121	CB3035	1		

8000A DIGITAL MULTIMETER INSTRUCTION MANUAL

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
R37, R38	Not Used						
R39	Res, car dep, 470Ω ±5%, 1/3W	343434	TOYO	R331-34745	1		
R40	Res, met film, 499k ±1%, 1/8W (8000A) (may not be included)	268813	91637	MFF1-84993F	1		
R40	Res, met film, 215k ±1%, 1/8W (8000A–01) (may not be included)	289470	91637	MFF1-82153F	1		
R41	Res, car dep, 3.9k ±5%, ¼W	342600	TOYO	R253R925	REF		
R42	Res, car dep, 470k ±5%, ¼W	342634	TOYO	R254745	REF		
R43	Res, car dep, 470k ±5%, ¼W	342634	TOYO	R254745	REF		
R44	Res, ww, current shunt, 900Ω	312611	89536	312611	1		
R45	Res, ww, current shunt, 90Ω	352401	89536	352401	1		
R46	Res, ww, current shunt, 9Ω	352419	89536	352419	1		
R47	Res, ww, current shunt, 1Ω	352427	89536	352427	1		
R48	Res, ww, 0.1Ω ±0.1%, ½W	345579	89536	345579	1	1	
R49	Res, car dep, 1k ±5%, ¼W, (8000A)	343426	TOYO	R251025	REF		
R50	Res, met film, 498Ω ±0.1%, 1/8W	352252	91637	MFF1-84980-P0RM0R1PCT	1		
R51	Res, met film, 4.53k ±0.1%, 1/8W	343467	91637	MFF1-84531-P0RM0R1PCT	1		
R52	Res, met film, 10.02k ±0.1%, 1/8W	352245	91637	MFF1-810R021-P0RM0R1PCT	1		
R53	Part of matched set, see 2	— — —	— —	— — —			
R54	Part of matched set, see 2	— — —	— —	— — —			
R55	Res, var, cermet, 50Ω ±10%, 1W	285122	71450	360550A	1	1	
R56	Part of matched set, see 1	— — —	— —	— — —			
R57	Part of matched set, see 1	— — —	— —	— — —			
R58	Part of matched set, see 1	— — —	— —	— — —			
R59	Part of matched set, see 2	— — —	— —	— — —			
R60	Res, met film, 5.62k ±1%, 1/8W	235168	91637	MFF1-85R261F	1		
RN1	Resistor network, 8 pc.	344069	89536	344069	1	1	
RN2	Resistor network, 11 pc.	344077	89536	344077	1		

8000A DIGITAL MULTIMETER INSTRUCTION MANUAL

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
S1 thru S12	Switch assembly, pushbutton	342915	89536	342915	1	1	
T1	Xformer, 115V (8000A and 8000A–02)	345629	89536	345629	1		
	Xformer, 230V (8000A and 8000A–02)	345629	89536	345629	1		
	Xformer, 115V (8000–01)	345637	89536	345637	1		
	Xformer, 230V (8000–01)	345637	89536	345637	1		
	Xformer, 100V (8000A and 8000A–02)	345645	89536	345645	1		
	Xformer, 100V (8000A–01)	345652	89536	345652	1		
T2	Xformer, inverter (8000A–01)	346049	89536	346049	1		
U1	I.C. Op. Amp. (AC Converter)	352930	89536	352930	1		
U2	I.C. Op. Amp. (Ohms Converter) 2	— — —	— —	— — —			
U3	Analog I.C. 1	— — —	— —	— — —			
U4	Digital I.C.	326017	89536	326017	1	1	
U5	I.C. TTL, BCD to 7-Seg. (Decoder Driver)	340109	89536	340109	1	1	
XF2	Contact, fuseholder (used with J2/XF2)	338665	89536	338665	1		
	Contact, battery (8000A–01)	344200	89536	344200	8		
	Holder, battery (8000A–01)	346932	89536	346932	2		
	Post, connector, uninsulated	267500	89536	267500	3		
	Shield, AC Converter	338673	89536	338673	1		
	Socket, I.C., 16 pin, Dual-in-Line (U3, U4, U5)	351916	82305	1440P	3		
	Socket, Short, 10-Contact	347815	82305	1477	1		

1 CR20, R56, R57, R58, and U3 are a matched set. For replacement, order ANALOG RESISTOR SET, STOCK NO. 345496.

2 CR3, R53, R54, R59, and U2 are a matched set. For replacement, order OHMS RESISTOR SET, STOCK NO. 345504.

3 R1, R2, and R3 are a matched set. For replacement, order INPUT DIVIDER RESISTOR SET, STOCK NO. 306407.

8000A DIGITAL MULTIMETER INSTRUCTION MANUAL

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
	NOTE: If one or more components in a set require replacement, the entire set must be replaced.						
A2	FRONT PANEL ASSEMBLY	---	---	---			
F2	Fuse, fast acting, 2 amp	346940	89536	346940	1	5	
J1	Jack, banana, red	162065	74970	108902	1		
J2/XF2	Jack/Fuseholder, banana/barrel, red	345611	89536	345611	1		
J3	Jack, banana, black	162073	74970	108903	1		
	Lens, red	338616	89536	338616	1		
	Retainer, Neoprene Grommet	352484	89536	352484	2		
	Panel, front, molded (no decal)	330084	89536	330084	1		
	Decal, Front Panel	343756	89536	343756			
A3	DISPLAY ASSEMBLY	REF					
DS1	Diode, Light-emitting, alpha numeric, (± & 1) red	334581	29083	MAN101A	1	1	
DS2, DS3	Diode, Light-emitting, alpha numeric, (0-9) red	334573	29083	MAN10A	3	1	
	Printed Circuit, Display	338343	89536	338343	1		

DIGITAL PRINTER OUTPUT UNIT, OPTION –02

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
	DIGITAL PRINTER OUTPUT UNIT, OPTION –02 (Figure 5-3)						
C1	Cap, cer, 500 pf ±10%, 500V	105692	71590	Type CE501	2		
C2	Cap, cer, 500pf ±10%, 500V	105692	71590	Type CE501	REF		
CR1	Diode, sil, 150mA	203323	07263	1N4148	4		
CR2	Diode, sil, 150mA	203323	07263	1N4148	REF		
CR3	Diode, sil, 150mA	203323	07263	1N4148	REF		
CR4	Diode, sil, 150mA	203323	07263	1N4148	REF		
P1	Connector, card edge, 20 contact	352310	NAT. CONN.	A202389-04	1		
R1	Res, comp, 10k ±5%, ¼W	148106	01121	CB1035	3		
R2	Res, comp, 100k ±5%, ¼W	148189	01121	CB1045	2		
R3	Not used						
R4	Res, comp, 33k ±5%, ¼W	148155	01121	CB3335	1		
R5	Res, comp, 10k ±5%, ¼W	148106	01121	CB1035	REF		
R6	Res, comp, 100k ±5%, ¼W	148189	01121	CB1045	REF		
R7	Res, comp, 10k ±5%, ¼W	148106	01121	CB1035	REF		
RN1	Res, network, 7 res, 15k ±5%, ¼W	352054	56289	# 760-3	4		
RN2	Res, network, 7 res, 15k ±5%, ¼W	352054	56289	# 760-3	REF		
RN3	Res, network, 7 res, 15k ±5%, ¼W	352054	56289	# 760-3	REF		
RN4	Res, network, 13 res, 15k ±5%, ¼W	352047	56289	# 760-1	1		
RN5	Res, network, 7 res, 15k ±5%, ¼W	352054	56289	# 760-3	REF		E
U1	I.C., MOS, dual D flip-flop	340117	04713	MC14013L	1		
U2	I.C., MOS, dual 4-bit shift register	340125	04713	MC14015CL	2		
U3	E.C., MOS, dual 4-bit shift register	340125	04713	MC14015CL	REF		
U4	I.C., hex inverter	352039	12040	SN7404N	1		
U5, U6, U7	Not used						

DIGITAL PRINTER OUTPUT UNIT, OPTION –02

REF DESIG OR ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG FED SPLY CDE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
U8	I.C., linear, 5 tstr., NPN sil	248906	95303	CA3046	4		
U9	I.C., linear, 5 tstr., NPN sil	248906	95303	CA3046	REF		
U10	I.C., linear, 5 tstr, NPN sil	248906	95303	CA3046	REF		
U11	I.C., linear, 5 tstr., NPN sil	248906	95303	CA3046	REF		
	Backshell, connector	357020	89536	357020	1		

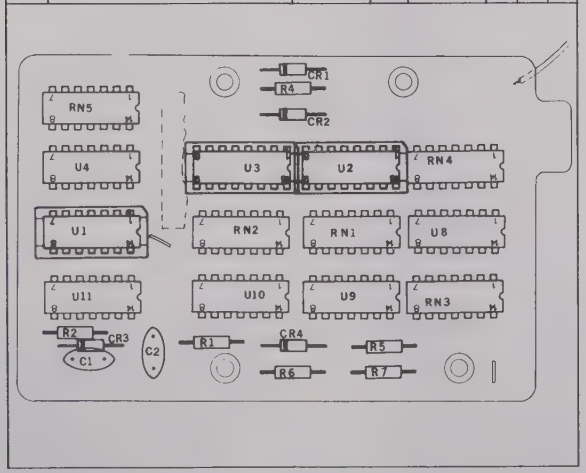


Figure 5-3. DPOU PCB ASSEMBLY, OPTION –02

Section 6

Option & Accessory Information

6-1. INTRODUCTION

6-2. Several accessories are available for use with the Model 8000A. These accessories are listed in Table 1-1 of Section 1 in this instruction manual. This section describes each accessory and how it is used with the Model 8000A.

6-3. CARRYING CASE (C80)

6-4. The carrying case is illustrated in Figure 6-1. It is a soft vinyl case with carrying strap, fitted to the Model 8000A. A storage compartment is provided for test leads, power cord and other compact accessories.

6-5. FRONT PANEL DUST COVER (M00-100-714)

6-6. The molded plastic dust cover accessory snaps-on over the front panel of the Model 8000A. This cover affords protection to the front panel and controls.

6-7. RACK MOUNT KITS (M00-200-611/612)

6-8. Both rack mount kits provide full width panel mounts 3½ inches in height to fit standard 19 inch E.I.A. racks. One, -612, centers the Model 8000A in the full width panel. The other, -611, provides offset, left or right side, mounting of the instrument. Use the following procedure for installing the instrument into either rack mounting panel. Figure 6-2

illustrates assembly of the center mount panel. Assembly of the offset mount panel is identical.

a. Disassemble carrying handle from case by removing handle disc decals and mounting screws.

b. Remove instrument retaining screw at rear of case, and remove instrument from case.

c. Install side mounting brackets as shown in Figure 6-2, and secure to mounting panel with nuts provided.

d. Partially insert instrument case through mounting panel.

e. Install handle mounting screws through brackets into handle mounting bosses on case. Avoid stripping threads in handle mounting boss.

f. Re-install instrument into case, securing with retaining screw at rear of case.

Figure 6-1. C80, CARRYING CASE

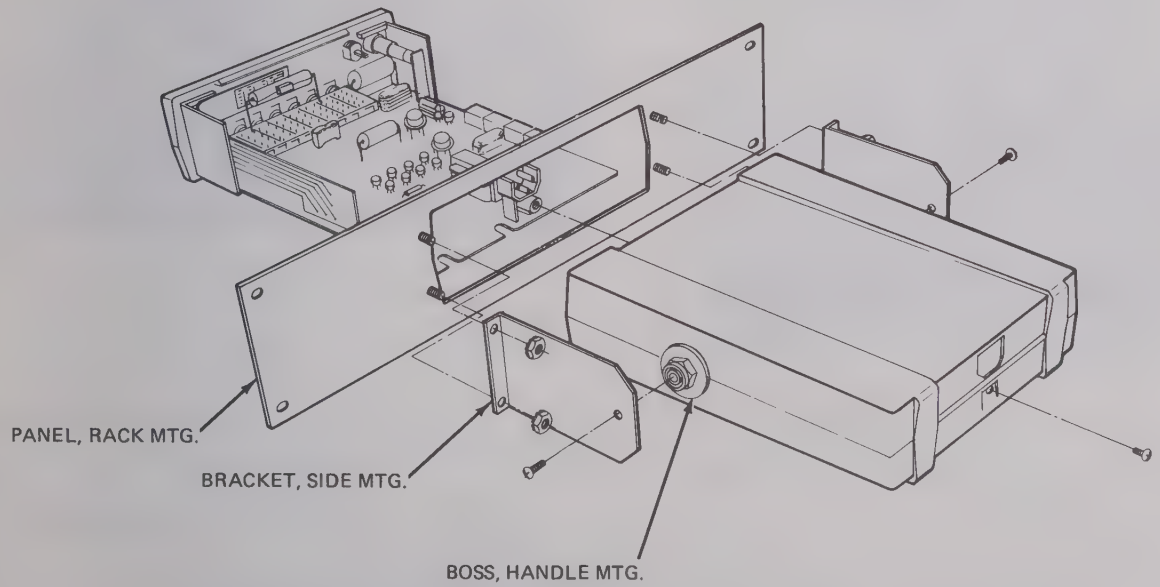


Figure 6-2. RACK MOUNTING ASSEMBLY

6-9. DELUXE TEST LEAD KIT (A80)

6-10. The test lead kit is shown in Figure 6-3. Kit contains two color coded test leads with threaded adapters. These adapters attach to banana plugs. pin tips. test prod tips. alligator clips. and binding post lugs included in kit.

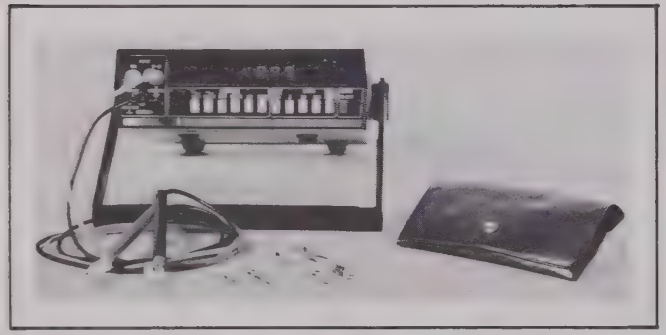


Figure 6-3. A80, DELUXE TEST LEAD KIT

6-11. CLAMP-ON AC HIGH CURRENT PROBE (80I-600)

6-12. Introduction

6-13. Figure 6-4 shows the High Current Probe. The 80I-600 extends the ac current measurement capability of the Model 8000A DMM. AC current measurements can be made from 2 to 600 amperes at up to 400 Hz with ±3% accuracy.

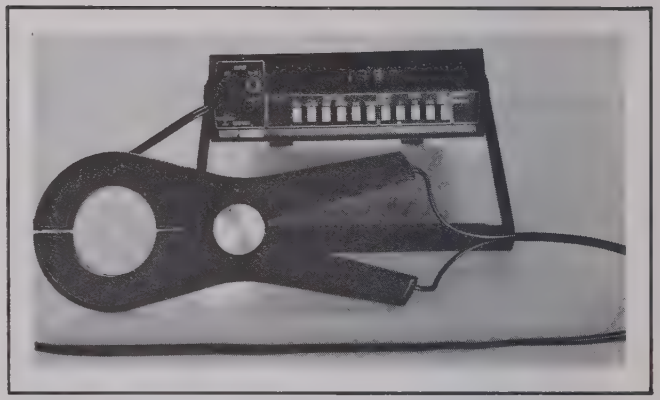


Figure 6-4. 80I-600, AC HIGH CURRENT PROBE

6-14. Operation

6-15. Use the following procedure for operating the 8000A DMM with the 80I-600 current probe.

a. Plug 80I-600 into MA and COMMON INPUT terminals on 8000A front panel.

b. Select AC MA FUNCTION pushbutton.

c. Select RANGE pushbutton in accordance with the following table. (The table accounts for the probe division ratio of 1000:1.)

Table 6-1. AC CURRENT PROBE

8000A RANGE PUSH-BUTTON	8000A CURRENT RANGE WITH PROBE	8000A READOUT RANGE WITH PROBE (Amperes)
2000 MA	200A to 600A	200. to 600.
200	20A to 200A	20.0 to 199.9
20	2A to 20A	2.00 to 19.99

d. Clamp probe around current carrying conductor to be measured. Observe readout on 8000A DMM in amperes.

NOTE!

Clamping probe around more than one current carrying conductor at a time produces a reading that is the vector sum of the currents in the conductors.

6-16. HIGH VOLTAGE PROBE (80K-30)

6-17. Introduction

6-18. Figure 6-5 shows the High Voltage Probe. The dc voltage range of the Model 8000A DMM can be extended to 30 kilovolts when used with the 80K-30 High Voltage Probe. Specifications for the high voltage probe are given below. A schematic diagram is shown in Figure 6-6.

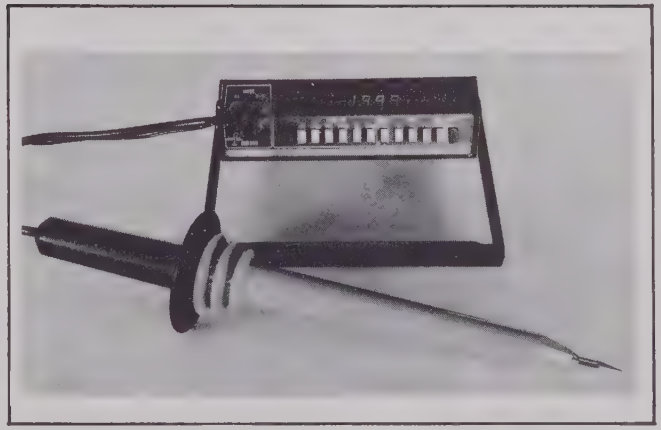


Figure 6-5. 80K-30, HIGH VOLTAGE PROBE

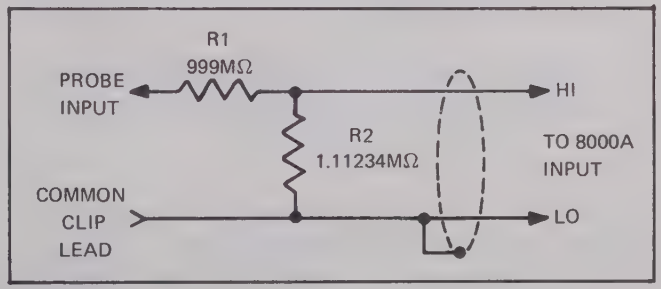


Figure 6-6. 80K-30 SCHEMATIC DIAGRAM

Voltage Range, 1 kV-30 kV
Input Resistance, 1000 MΩ
Division Ratio, 1000:1
Ratio Accuracy, ±1.0% @ 25 kV
Operating Temp. Range, 0 - 50°C
Humidity Range, 0 - 80 % RH
Cable Length, 5′ (1,5 meters)

NOTE!

(1) Calibrated for 10 MΩ voltmeter input resistance

(2) The overall accuracy specification from 20 kV to 30 kV is ±2%; this includes the total effects of ratio accuracy, voltage coefficient, temperature coefficient, long-term stability, power coefficient, and 8000A multimeter accuracy.

6-19. Operation

6-20. Use the following procedure for operating the Model 8000A DMM with the 80K-30 High Voltage Probe.

a. Plug high voltage probe cable assembly into the V–Ω and COMMON INPUT terminals on the 8000A front panel.

NOTE!

Ensure that plug associated with keyed side of dual banana plug is connected to COMMON terminal on 8000A.

b. Select DCV FUNCTION pushbutton.

c. Select RANGE pushbutton in accordance with Table 6-2. (The table accounts for the probe division ratio of 1000:1.)

Table 6-2. HIGH VOLTAGE PROBE.

8000A RANGE PUSHBUTTON	8000A DC VOLTAGE RANGE WITH PROBE	8000A READOUT RANGE WITH PROBE (Kilovolts)
200	20 kV to 30 kV	20.0 to 30.0
20	2 kV to 20 kV	2.00 to 19.99
2	1 kV to 2 kV	1.000 to 1.999

d. With common lead connected to suitable ground, connect probe to point to be measured. Observe readout on 8000A DMM in kilovolts.

CAUTION!

Always connect common lead to ground before touching high voltage probe to high voltage source. Failure to do so may result in damage to instrument.

6-21. HIGH FREQUENCY PROBE (80RF-1)

6-22. Introduction

6-23. The Model 80RF-1 High Frequency Probe, Figure 6-7, allows measurements over a frequency range of 100 kHz to 500 MHz from

1.25 to 30 volts when using FLUKE voltmeters having an input impedance of 10 megohms ±10%. The accuracy of measurement is ±5% from 100 kHz to 100 MHz and ±7% to 500 MHz. The probe operates into any dc voltmeter having an input impedance of 10 megohms ±10%. A shielded dual-banana plug on the probe permits direct connection to the voltmeter input, an adapter is provided for connection to the 8000A.

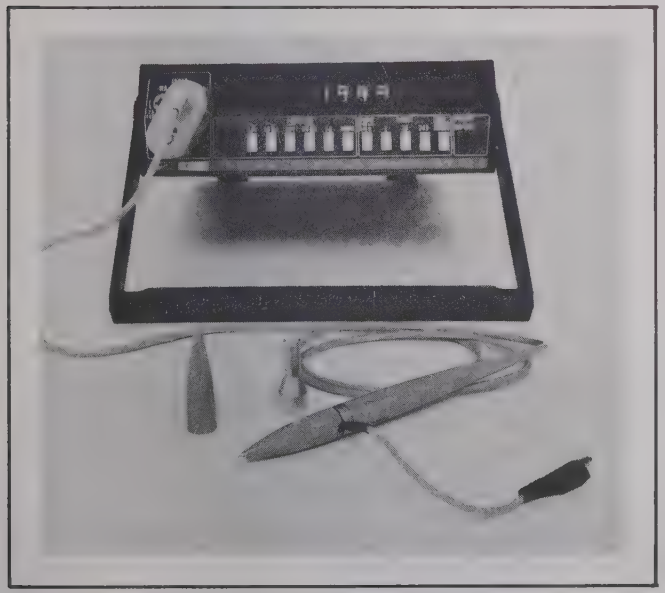


Figure 6-7. 80RF–1, HIGH FREQUENCY PROBE

6-24. Specifications

6-25. ELECTRICAL

Voltage: 0.25V to 30V

Response: Responds to peak value of input. Calibrated to read rms value of a sine wave input.

AC to DC Transfer Accuracy: Loaded with 10 megohms ±10%.

	100 KHz–100 MHz	100 MHz–500 MHz
+10°C to +30°C	±5%	±7%
–10°C to +40°C	±7%	±15%

< ±3 db at 10 kHz and 700 MHz

Input Impedance: 4 megohms shunted by 2 ±0.5 pf.

Maximum Input: 30 volts rms AC, 200 volts DC.

6-26. GENERAL

Cable Connections: Shielded dual banana plug fits all standard 3/4-inch dual banana connectors.

Cable Length: 4 ft. (121,9 cm) minimum.

Weight: 3½ oz. net.

Accessories: Ground Lead, Straight Tip, Hook Tip, High Frequency Adapter

6-27. Operation

6-28. Connect the shielded dual banana plug directly to the voltmeter input terminals, GND to COMMON or LO. Affix the appropriate probe tip to the probe body, then connect the probe to the high frequency circuit under test. When using the Straight or Hook Tip the ground clip must be connected to the test circuit. When using the high frequency adapter with appropriate 50 ohm connectors, the ground clip is not required.

6-29. The Straight Tip or Hook Tip supplied with the probe can be used for measurements up to 100 MHz. For measurements above 100 MHz the High Frequency Adapter allows connections to 50 ohm terminations. Ensure that the probe is used in conjunction with dc voltmeters having 10 MΩ ±10% input impedance to meet its specifications.

6-30. The maximum input to the probe is 30 volts rms ac, or 200 volts dc. These factors may be used in combination so that an ac signal may be measured riding on a dc voltage of up to 200 volts. However, it must be noted that if ac superimposed on dc is being measured, the dc level must not be changed by more than 200 volts or the resulting transient is apt to damage the diodes inside the probe.

6-31. Theory of Operation

6-32. Figure 6-8 contains a schematic diagram of the probe. C1 is a dc blocking capacitor, CR1 is used as a detector, and R1, R3, CR2, R2, and Rin form a divider network. C1, charging through CR1 during the negative half cycle of the input produces a positive dc voltage at the CR1-R1 junction which equals the negative peak value of the input signal. The divider network reduces this to the rms value of the input. It can be seen that the probe must be operated into a 10 MΩ load in order to maintain the proper division ratio.

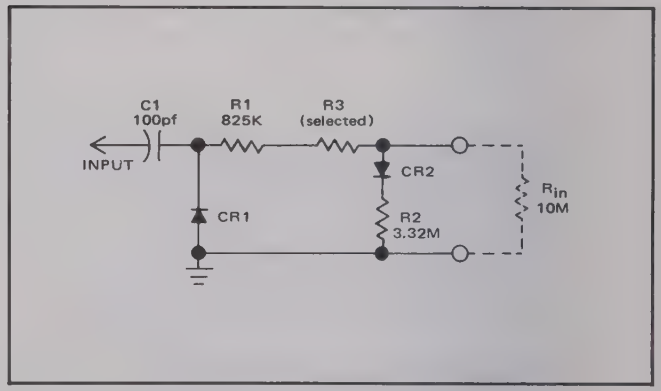


Figure 6-8. 80RF-1 SCHEMATIC

6-33. CR2 provides compensation for the non-linearity of the detector. R3 is a selected part having a value of 50 kΩ to 100 kΩ, as required for proper divider action.

6-34. Maintenance

6-35. PERFORMANCE CHECKS

6-36. The following checks verify the probe AC to DC Transfer accuracy.

6-37. Low Frequency Response

6-38. Connect equipment as shown in Figure 6-9 , and perform the following steps.

a. With equipment as shown in connection "A" adjust the ac signal source for an output of 3.000 volts rms at 100 kHz as measured on the DVM.

b. In connection "B" with the DVM set to measure dc, observe a probe output of 3.15 to 2.85 volts.

c. Placing cables back in connection "A", decrease the ac signal source by 10 db (0.95 volts).

d. Moving back to connection "B", observe a voltmeter indication of between 1.00 and 0.90 volts (10 db down from 3 volts).

e. In connection "A", decrease the ac signal source an additional 10 db (to 0.3 volts) as indicated by the voltmeter in its ac function.

f. Back to "B", observe a voltmeter reading of .315 to .285 Vdc.

g. Return the ac signal source back to 3.000 Vrms.

h. Repeat steps a through g with frequencies of 500 kHz, 1 MHz, and 10 MHz.

6-39. High Frequency Response

6-40. Connect equipment to the 80-RF probe as shown in Figure 6-10, and perform the following steps:

a. Set the ac signal source to 100 MHz with an output level of 10 milliwatts as indicated on the power meter. Ensure that the ac signal source has stabilized at 10 millivolts output.

b. Observe that the voltmeter indication is between 0.757 and 0.657 volts. (0.707 volts corresponds to 10 milliwatts in 50 ohms.)

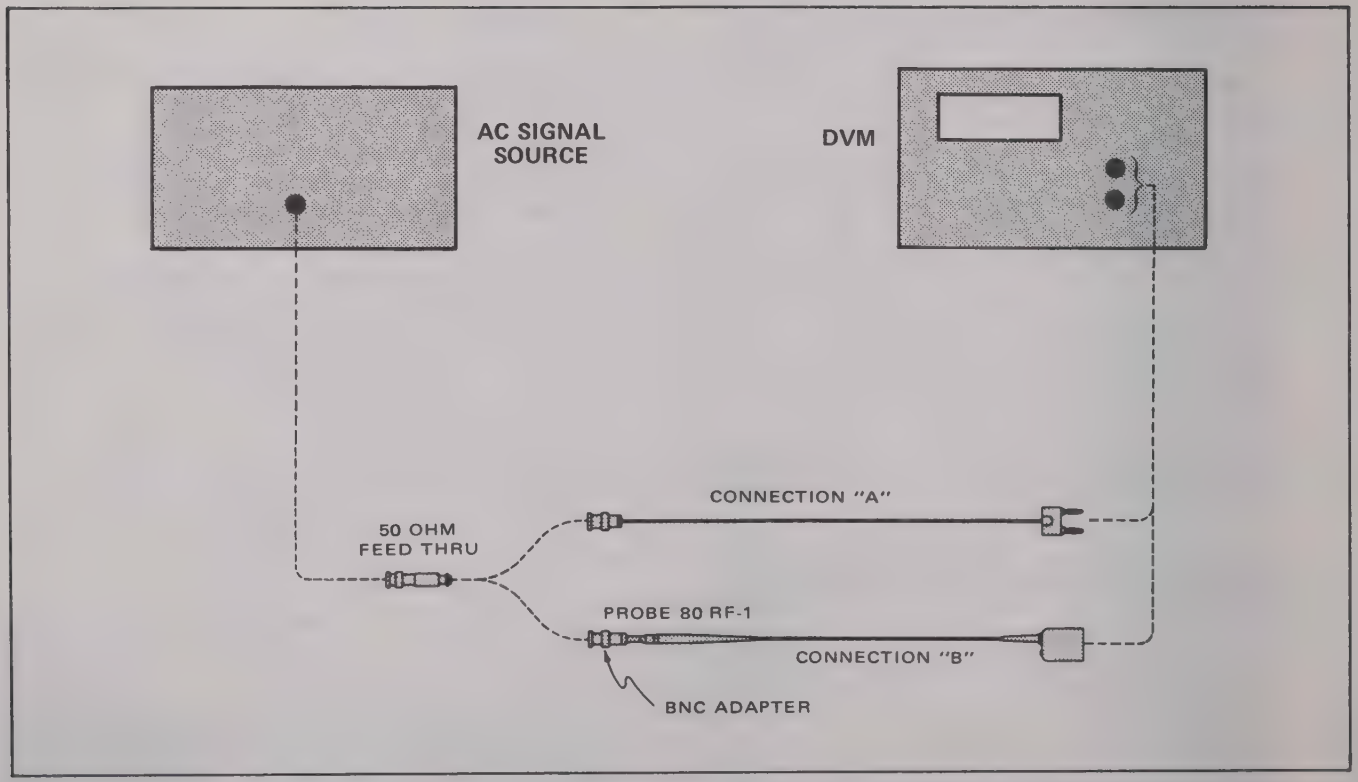
c. Repeat the above for frequencies fo 200 MHz, 300 MHz, 400 MHz, and 480 MHz.

6-41. CALIBRATION

6-42. Should the 80-RF require recalibration, perform the following steps:

a. Perform steps a and b in paragraph 6-37, with a frequency of 1 MHz.

b. Observe the dc voltmeter indication; a reading below 3 volts calls for a decrease in the value of R3, a reading above 3 volts calls for an increase in R3. Resistor R3 should be a 1/8W metal film type. In a probe that is working properly, a 30 kΩ change in R3 will produce about a 1% reading deviation.



Figuer 6-9. LOW FREQUENCY RESPONSE CHECK

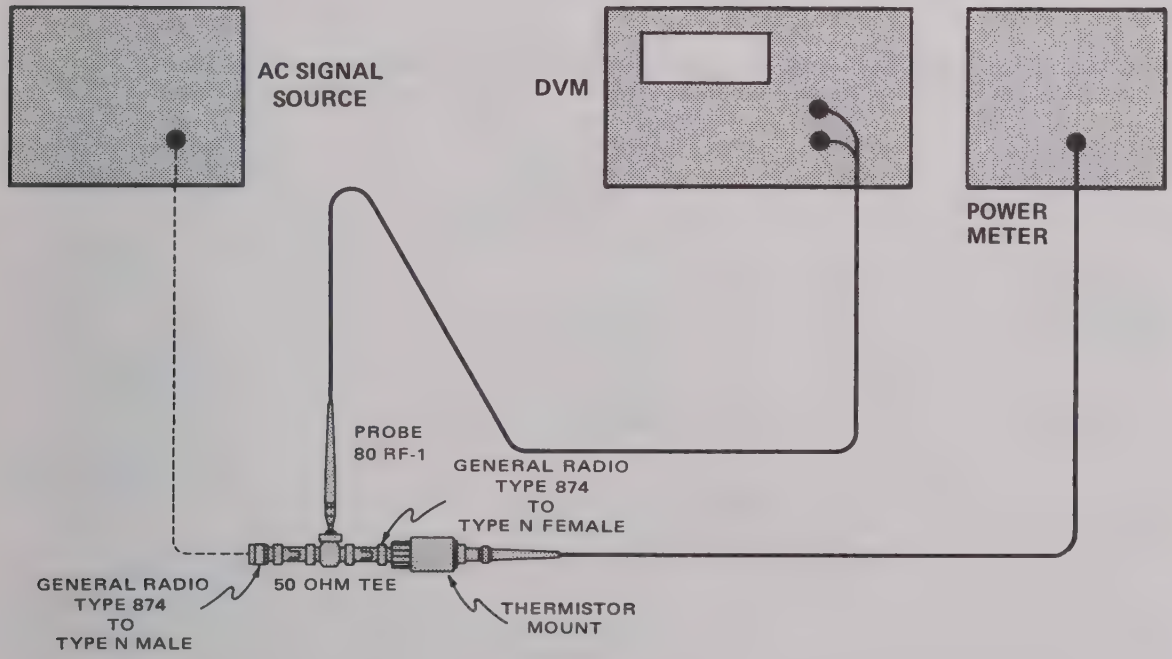


Figure 6-10. HIGH FREQUENCY RESPONSE CHECK

APPENDIX A – FEDERAL SUPPLY CODE FOR MANUFACTURES

A-1. CODE TO NAME

A-2. The following five digit code numbers are listed in numerical sequence along with the manufacturer's name and address to which the code has been assigned. The Federal Supply Code has been taken from Cataloging Handbook H 4-2, Code to Name.

01121 Allen-Bradley Co.
Milwaukee, Wisconsin

01281 TRW Semiconductors
Lawndale, California

02799 Arco Capacitors, Inc.
Torrence California

03508 General Electric Co.
Semiconductor Products
Syracuse, New York

03877 Transitron Electronic Corp.
Wakefield, Massachusetts

04713 Motorola Semiconductor
Products Inc.
Phoenix Arizona

06001 General Electric Co.
Capacitor Department
Irmo South Carolina

07263 Fairchild Semiconductor
Div. of Fairchild Camera
& Instrument Corp.
Mountain View, California

07910 Teledyne Corp.
(Continental Device)
Hawthorne, California

07933 Raytheon Co.
Mountain View, California

08806 General Electric Co.
Miniature Lamp Dept.
Cleveland, Ohio

11711 General Instrument Corp.
Newark New Jersey

12040 National Semiconductor Corp.
Danburry, Connecticut

12954 Dickson Electronics Corp.
Scottsdale, Arizona

13934 Midwec Corp.
Oshkosh, Nebraska

14099 Semtech Corp.
Newbury Park, California

14655 Cornell-Dubilier Electronics
Newark, New Jersey

15818 Amelco Semiconductor
Div. of Teledyne Inc.
Mountain View, California

17856 Siliconix, Inc.
Sunnyvale, California

29083 Monsanto, Co., Inc.
Santa Clara, California

56289 Sprague Electric Co.
North Adams, Massachusetts

71400 Bussmann Mfg.
Div. of McGraw–Elison Co.
Saint Louis, Missouri

71450 CTS Corp.
Elkhart, Indiana

71590 Centralab
Div. of Globe Union Inc.
Milwaukee, Wisconsin

72982 Erie Tech. Products Inc.
Erie, Pennsylvania

73445 Amperex Electronic Corp.
Hicksville, New York

73899 JFD Electronics Co.
Brooklyn, New York

74970 Johnson, E.F., Co.
Waseca, Minnesota

80031 Mepco
Div. of Sessions Clock Co.
Morristown, New Jersey

82305 Palmer Electronics Corp.
South Gate, California

89536 Fluke, John Mfg. Co., Inc.
Seattle, Washington

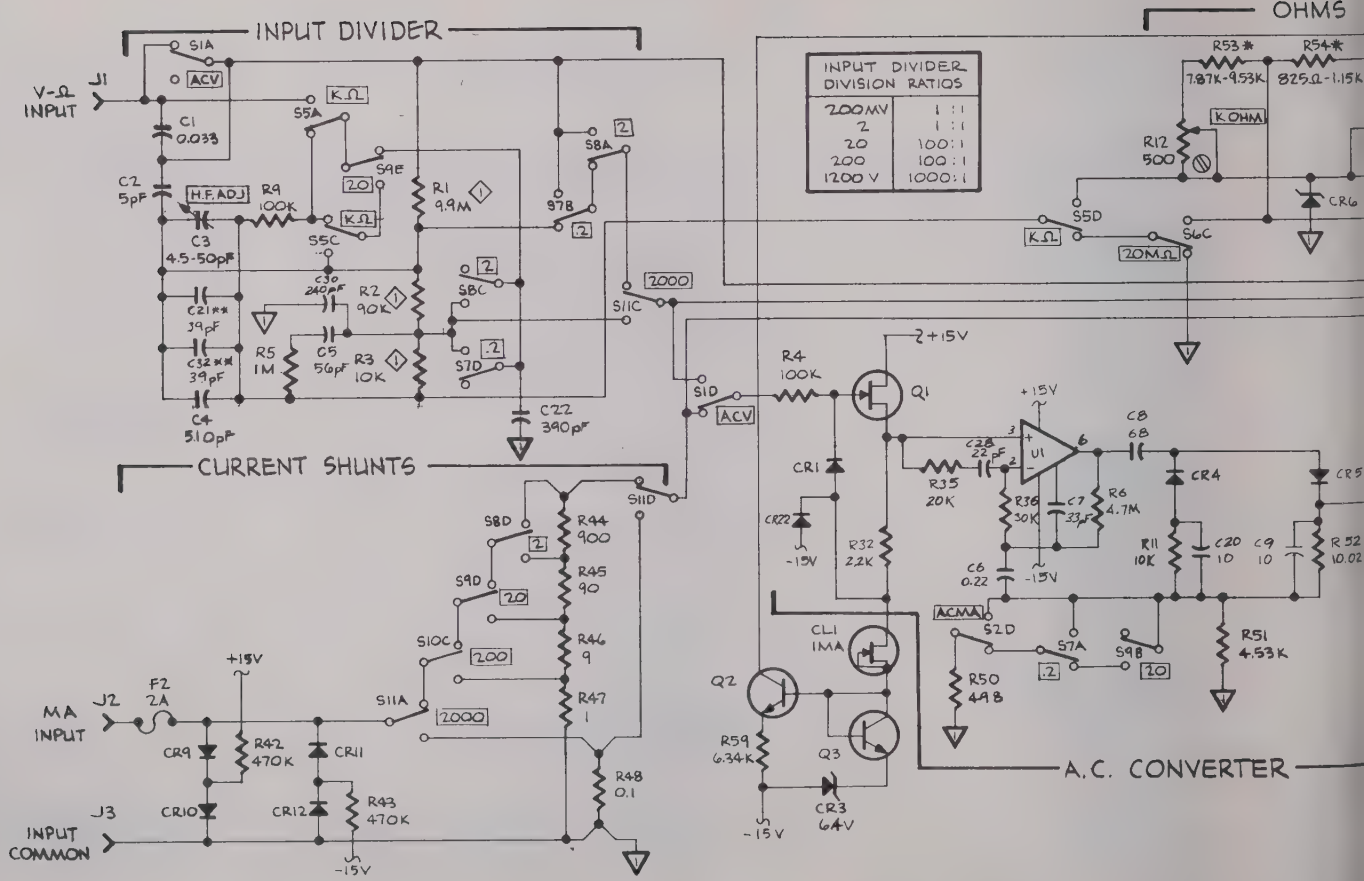
91637 Dale Electronics Inc.
Columbus, Nebraska

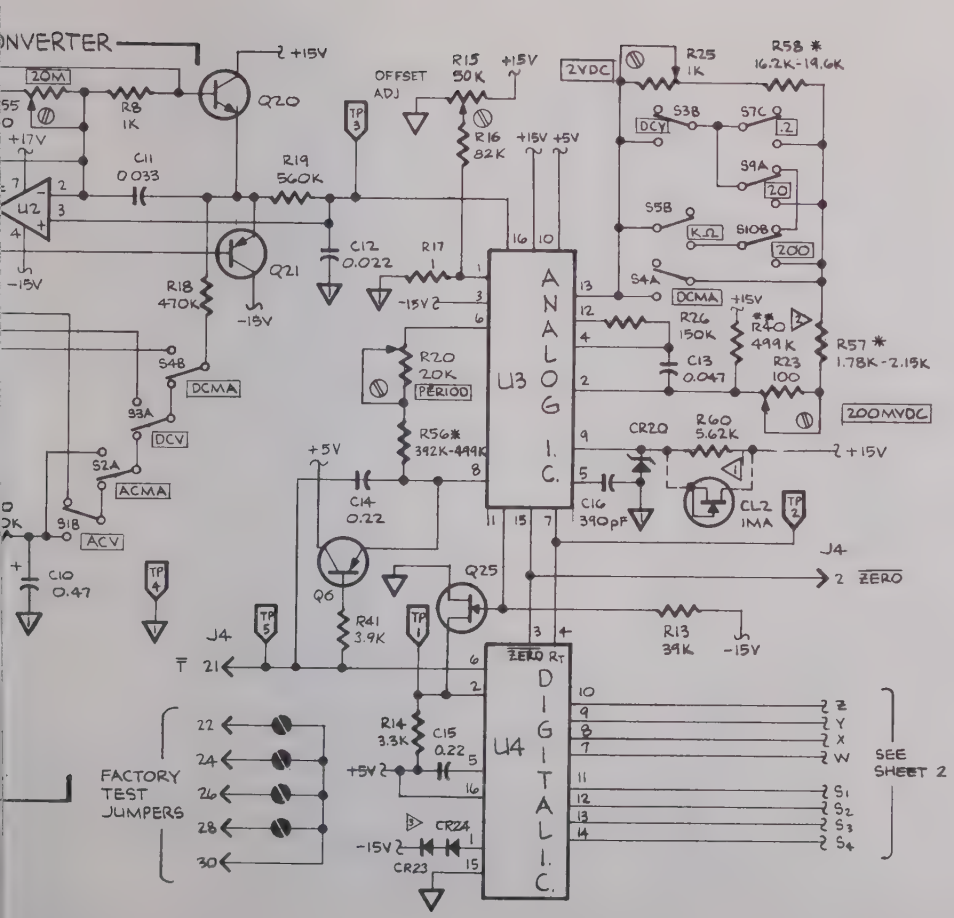
95303 Radio Corp. of America
Solid State & Receiving
Tube Div.
Cincinnati, Ohio

99392 STM Corp.
Oakland, California

Toyo Electronics
R–Ohm Corp.
Irvine, California

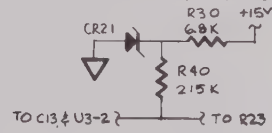
National Connector
Minneapolis, Minnesota


INPUT DIVIDER
OHMS
CURRENT SHUNTS
A.C. CONVERTER
V-Ω INPUT
J1
S1A
ACV
K.Ω
S5A
S9E
20
2
S8A
S7B
.2
C1 0.033
C2 5pF
H.F. ADJ
R9 100K
C3 4.5-50pF
S5C
R1 9.9M
1
C30 240pF
R2 90K
S8C
S7D
C21** 39pF
C32** 39pF
C4 510pF
R5 1M
C5 56pF
R3 10K
C22 390pF
2000
S11C
S1D
INPUT DIVIDER DIVISION RATIOS
200MV 1 : 1
2 1 : 1
20 100 : 1
200 100 : 1
1200 V 1000 : 1
R53* 7.87K-9.53K
R54* 825Ω-1.15K
R12 500
K OHM
CR6
S5D
S6C
20MΩ
+15V
R4 100K
Q1
CR1
CR22
-15V
C28 22pF
U1
R35 20K
R36 30K
C7 33pF
R6 4.7M
C6 0.22
C8 68
CR4
CR5
R11 10K
C20 10
C9 10
R52 10.02
R32 2.2K
ACMA
S2D
S7A
S9B
R50 4.98
R51 4.53K
CL1 1MA
Q2
Q3
R59 6.34K
CR3 6.4V
-15V
MA INPUT
J2
F2 2A
S11A
R42 470K
CR9
CR11
CR10
CR12
R43 470K
J3
INPUT COMMON
S8D
S9D
S10C
R44 900
R45 90
R46 9
R47 1
R48 0.1



NOTES:

1. ALL CAPACITANCE IN MICROFARADS AND ALL RESISTANCE IN OHMS UNLESS OTHERWISE NOTED.
2. * FACTORY SELECTED PART(S).
3. ALL SWITCHES SHOWN IN NON-DEPRESSED POSITION.
4. ▽ SUPPLY COMMON.
   ▽ SIGNAL COMMON.
5. J4 - BOARD EDGE CONNECTOR.
6. ● P C B JUMPER
7. ⊘ INTERNAL ADJUSTMENT
8. ▷ RESISTOR USED IN LINE POWERED INSTRUMENTS. CURRENT REGULATOR USED IN BATTERY POWERED INSTRUMENTS.
9. ** COMPONENT MAY NOT BE INSTALLED.
10. ③ CR23 AND CR24 USED ONLY IN 8000A-01
11. ① MATCHED SET
12. ② CONFIGURATION SHOWN FOR 8000A AND 8000A-02. 8000A-01 AS SHOWN BELOW:

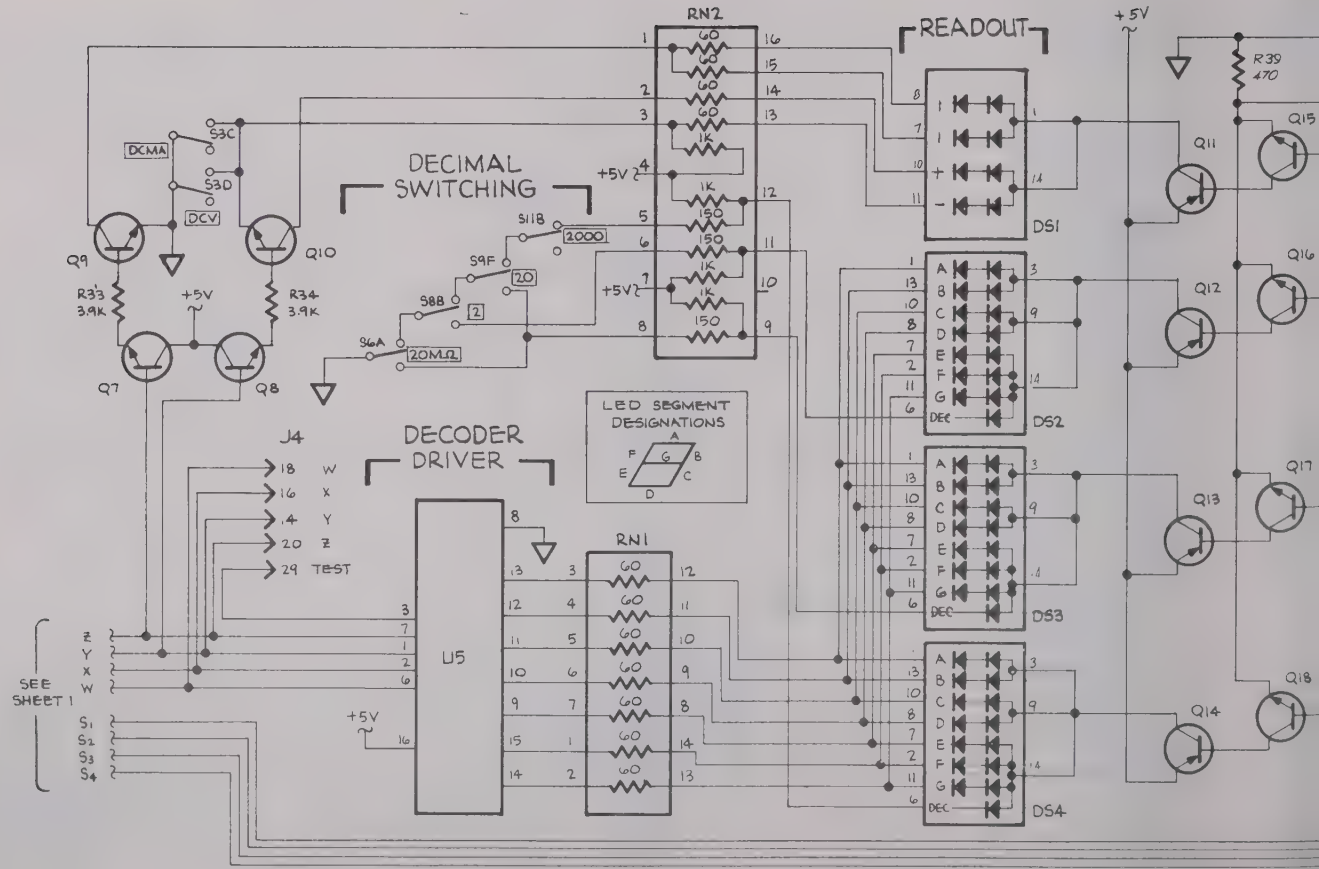


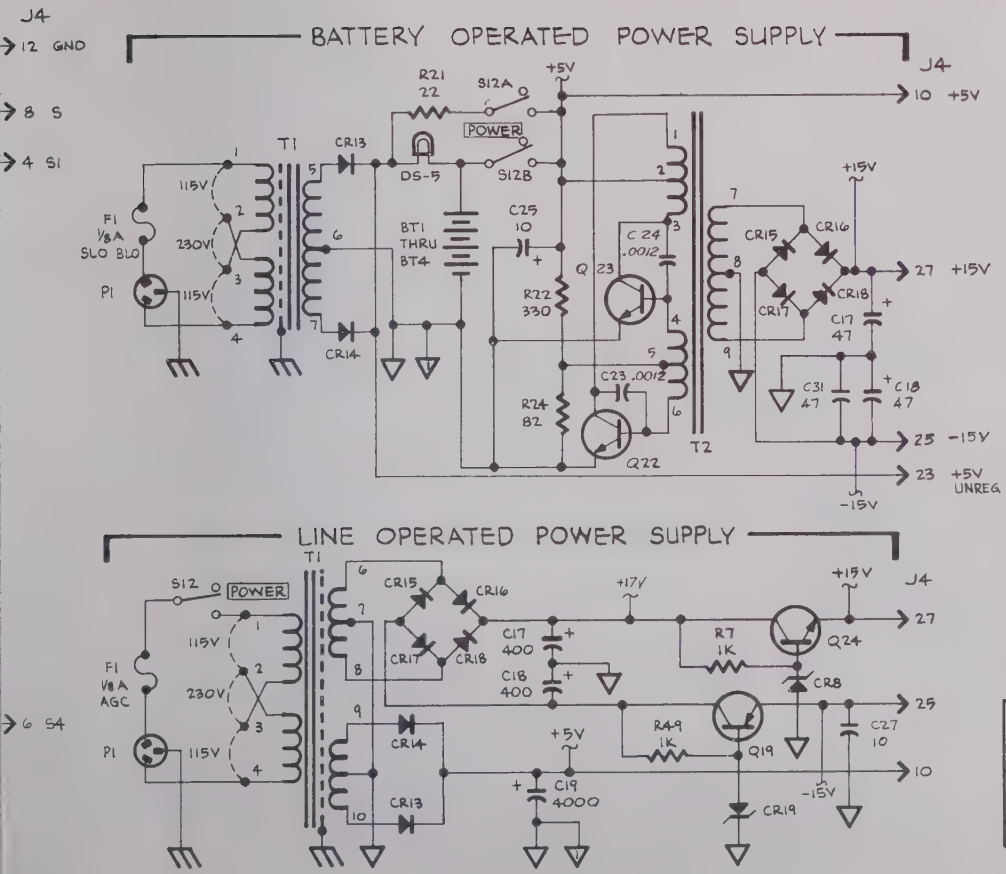
REV	DESCRIPTION
3	ADD: C30, C31, C32, C28, R15, R16, R17, R32, R35, R36, CR22; CH6: C4, R5; DLT: CR2, C27
2	ADD: C23, R40, NOTE 13; CHG C6, C15
1	INITIAL ISSUE

8000A DIGITAL MULTIMETER

8000A-1001

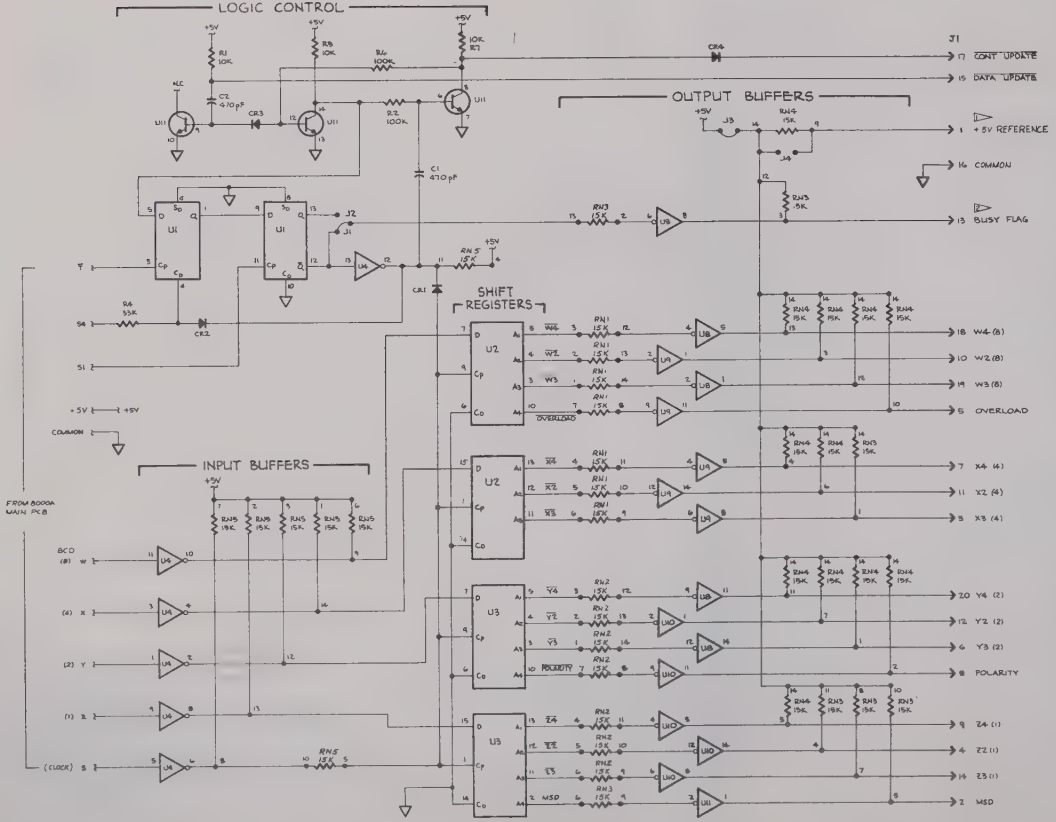
DATE	JULY 1973	SHEET 1 OF 2


RN2
READOUT
+5V
DECIMAL SWITCHING
S3C
S3D
DCMA
DCV
Q9
Q10
R33 3.9K
R34 3.9K
Q7
Q8
S11B
2000
S9F
20
S8B
2
S6A
20MΩ
LED SEGMENT DESIGNATIONS
J4
18 W
16 X
14 Y
20 Z
29 TEST
DECODER DRIVER
U5
RN1
SEE SHEET 1
Z
Y
X
W
S1
S2
S3
S4
DS1
DS2
DS3
DS4
R39 470
Q11
Q12
Q13
Q14
Q15
Q16
Q17
Q18



(FOR NOTES AND REVISIONS SEE SHEET 1)

8000A DIGITAL MULTIMETER		
8000A-1001		
DATE	JULY 1973	SHEET 2 OF 2



NOTES:

1. ALL RESISTANCE'S IN OHMS AND ALL CAPACITANCE IS IN MICROFARADS UNLESS OTHERWISE NOTED.
2.

BCD DIG.	8	4	2	1
2ND	W2	X2	Y2	Z2
3RD	W3	X3	Y3	Z3
4TH	W4	X4	Y4	Z4

3. MODIFIABLE FOR CONNECTION OF EXTERNAL PULL-UP VOLTAGE SEE INSTRUCTION MANUAL, SECTION 4
4. MODIFIABLE TO READY FLAG. SEE INSTRUCTION MANUAL, SECTION 4.

8000A-02, DPOU	
8000A-1012	
DATE	JULY 1973
SHEET 1 OF 1	

Notes

Notes

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